林試研報 Bull. Gov. For. Exp. Sta. No. 292, 1977 1~25

Fungi Parasitic to Woody Plants in Yaku Island, Southern Kyusyu, Japan

By

Takao KOBAYASHI[1]

Summary : In this report 25 species of fungi belonging to 20 genera, which are parasitic to woody plants, were newly added to the fungous flora of Yaku Island. Among them 10 are new species and 2 are new record from Japan. Seven new host plants for them were recorded. In total 165 species of 75 genera inhabiting woody and vine plants are listed. Among them 25 species of 19 genera are known only from this Island. Nineteen fungi belonging to 15 genera have their most southern delimitation in Yaku Island, whereas 20 species of 14 genera have their most northern delimitation in the Island.

Introduction

Yaku Island is located at 60 km south of Kyushu, Japan, and constitute the Ôsumi Island with Tanegashima and Kuchinoerabu Islands. It is situated between lat. 30 N and 31 N, and between long. 130 E and 131 E. Area of the Island extends over 500 km^2. Mt. Miyanoura, Mt. Nagata and Mt. Kuromi tower over 1,800 m above sea level and make the highest mountainous area in Kyushu District.

The meteorological characteristic of Yaku Island is the large amounts of its precipitation. In the mountainous area, annual rainfall amounts to 7,000~8,000 mm and that in the coastal area to 3,000~5,000 mm. Another remarkable characteristic is a variation in its vegetation. Lowland area along seaside is occupied by subtropical rain forests. Members of these forests transitionally change to those of temperate coniferous forests, which are mainly constituted from *Abies firma* and *Tsuga sieboldii*, as the elevation gradually raises. Highest area, 1,600 m above sea level, is occupied by low bushes which are chiefly constituted from *Rhododendron*.

Conclusively, the vegetation of Yaku Island varies largely from the coastal area to the top of the mountainous area. It consists of the southern and the northern elements. The parasitic fungi of the southern and northern origins are mixed corresponding to the southern or northern elements of the host plants.

Researches of the plant parasitic fungi in Yaku Island have hitherto been carried out by the several mycologists and plant pathologists. KATSUKI visited this Island three times and reported 47 species of the plant parasitic fungi belonging to 18 genera (KATSUKI 1953, 1955a, b). Among them 22 are listed as parasitic to the woody and the vine plants. MORIMOTO (1953) reported the rust fungus flora of the Island. Twelve rust fungi parasitic to the wood plants are listed by him. Rust fungi, 104 species of 20 genera, are recorded from Yaku Island by HIRATSUKA et al. (1955). Among them 38 species are listed on the woody plants. Besides them,

Received August 30, 1976 保 護—9 For. Prot.—9

(1) Division of Forest Protection

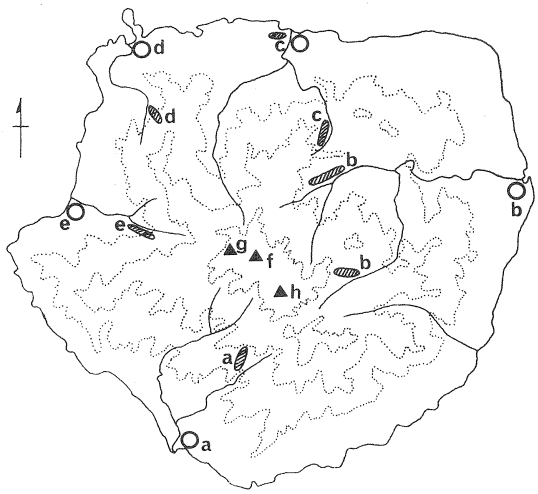

Figure 1 Localities collecting parasitic fungi in Yaku Island (scale 1/200,000)
Dotted lines indicate altitudes of 500, 1,000 and 1,500 m adove sea level.
a : Kurio (: ○ village, : ▨ area collected fungi)
b : Anbo　c : Miyanoura　d : Isso
e : Nagata　f : Mt. Miyanoura (1,935 m)
g : Mt. Nataga (1,890 m)　h : Mt. Kuromi (1,836 m)

Katumoto also visited this Island and described certain plant parasitic fungi in collaboration with Hino (Katumoto 1958, 1966, etc.). About 140 species of 60 genera, parasitic to woody plants, have been recorded from Yaku Island up to the present.

The author had a chance to visit Yaku Island from June 29 to July 9, 1975 with Dr. Yoshimichi Doi, National Science Museum, Tokyo, and he collected many fungi parasitic to woody plants. In this paper 25 species of 20 genera are added newly to the fungus flora of Yaku Island. Among them 8 are described as new species in the author's other paper (Kobayashi 1976) and 2 new species are described in this paper.

The author is indebted to the members of Kamiyaku and Shimoyaku District Forest Offices of the National Forest Agency for their help in collecting the materials.

Fungi parasitic to woody plants of Yaku Island collected in July of 1975*

1. *Aecidium rhaphiolepidis* Sydow, Ann. Myc. **20** : 61, 1922; Hiratsuka, Jour. Jap. Bot. **15** : 626, 1939; ——, Mem. Fac. Agr., Tokyo Univ. Educ. **1** : 89, 1952; —— et al., Sci. Bull. Agr. & Home Econ. Div., Univ. Ryukyus **2** : 58, 1955; Katsuki, Jour. Jap. Bot. **30** : 370, 1955; Morimoto, Jour. Jap. Bot. **28** : 315, 1953.

On living leaves of *Rhaphiolepis umbellata* (Thunb.) Makino (Sharinbai)—Kurio; Miyanoura

2. *Aecidium* sp.

On living leaves of *Smilax biflora* var. *trinervula* (Miq.) Hatusima (Sarumame)—Anbo.

3. *Ascochyta yakushimensis* Kobayashi, Mem. National Sci. Mus. **9**, 1976.

On living leaves of *Machilus japonica* Thunb. (Hosoba-tabu)—Kurio.

4. *Aulographum symplocacearum* Hino et Katumoto, Bull. Fac. Agr., Yamaguchi Univ. **9** :

* In this list, the following abbreviations are used :
(a) Locality and Date : Kurio—Yaku-cho, Kumage-gun, Kagoshima Prefecture, July 1, 1975. Anbo—Same as above, July 3, 1975. Miyanoura—Kamiyaku-cho, Kumage-gun, Kagoshima Pref., July 5, 1975. Nagata—Same as above, July 7, 1975. Isso—Same as above, July 8, 1975.
(b) Collector : Takao Kobayashi

909, 1958—(Plate 1 : A～D)

Syn. *Aulographum euryae* sensu KATSUKI (non SYDOW), Jour. Jap. Bot. **30** : 284, 1955.

On living leaves of *Symplocos myrtacea* Sieb. et Zucc. (Hainoki)—Anbo.

Note : KATSUKI (1955a) listed a species of *Aulographum* on *Symplocos myrtacea* as *A. euryae* SYDOW, which was described on *Eurya japonica* (SACCARDO 1902), from Yaku Island. He did not mention any notes on this fungus. Later, KATUMOTO (1958) described a new *Aulographum* on *Symplocos* as *A. symplocacearum* HINO et KATUMOTO. This fungus is quite different from *Aulographum euryae* in its sizes of asci and ascospores with enough independency. The author had a chance to examine a KATSUKI's specimen*) of *Aulographum euryae* on *Symplocos*. Fungus found on the specimen is not *Aulographum euryae* and accords with *A. symplocacearum*. Though *Aulographum symplocacearum* is known to be indigenous to Yaku Island (KATSUKI 1955a, KATUMOTO 1958), it is clear from the examination of the specimen that the fungus distributes in the other areas other than Yaku Island.

5. *Botryosphaeria dothidea* (MOUG. ex FR.) CES. et de NOT., Comment. Soc. Critt. Ital. **1** : 212, 1863; SACCARDO, Syll. Fung. **1** : 460, 1882; WINTER, Rabh. Kryptgfl. **2** : 801, 1887; LIND, Danish Fungi : 252, 1913; Arx & MÜLLER, Beit. Kryptgfl. Schw. **11**(1) : 37, 1954; MUNK, Dansk Bot. Arch. **17**(1) : 468, 1957; DENNIS, Brit. cup fungi : 237, 1960; ——, Brit. Ascom. : 373, 1968; KATUMOTO, Jour. Jap. Bot. **41**(11) : 329, 1966; SANDU-VILLE, Pyrenom. -Sphaer. Romania : 104, 1971; Barr, Contr. Univ. Michig. Herb. **9**(8) : 557, 1972—(Plate 1 : E, F; Plate 2 : A～D)

Stroma gregarious, at first immersed under epidermis and then erumpent, black, monolocular, but often coalesced and becoming multilocular, papillately protruded at the upper part of stroma, 1～2 mm in diameter, 500～650 μm in height. Cells of stroma pseudoparencymatous, thick-walled, blackish brown, irregular in shape, about 10～20 μm in diameter. Locules 190～220 μm in height and 80～130 μm in diameter, ostiolates. Ostioles 50～65 μm in diameter. Asci bitunicate, hyaline, clavate, with thick membrane at apex, 8-spored, 95～120×20～25 μm. Ascospores irregularly biseriate, hyaline to faintly yellowish, one-celled, fusoid or subrhomboid, 22.5～32.5×9～11.5 μm.

Conidia**) on PDA culture, hyaline, one-celled, fusoid, with large guttulate, 18～24×4～6 μm and 21.4×5 μm in average.

On bark of *Quercus salicina* BL. (Urajiro-gashi)—Kurio.

Note : Identification of the species in the genus *Botryosphaeria* is usually based on the difference in morphologic characteristics of the conidia and sizes of asci and ascospores (ARX & MÜLLER 1954, SHOEMAKER 1964, BARR 1972). Dimensions of asci and ascospores of the fungus collected from Yaku Island are somewhat larger than those of *Botryosphaeria dothidea* reported by ARX and MÜLLER (l. c.), KATUMOTO (1966) and BARR (l. c.). It is quite accordand with *Botryosphaeria dothidea* noted by SANDU-VILLE (1971). Shape and size of conidia produced on an ascospore isolate of the fungus are quite identical with those of *Botryosphaeria dothidea* reported by ARX and MÜLLER (l. c.) and BARR (l. c.).

6. *Botryosphaeria melanops* (TUL.) WINTER, Rabh. Kryptgfl. I, **2** : 800, 1887; Lind, Danich Fungi : 252, 1913; SHEAR & DAVIDSON, Mycol. **28** : 476, 1936; SHOEMAKER, Can. Jour. Bot. **42** : 1300, 1964; BARR, Contr. Univ. Michig. Herb. **9**(8) : 558, 1972.—(Figure 2; Plate 2 : E, F)

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*) On living leaves of *Symplocos myrtacea* S. et Z. (Hinoki)—Mt. Hikosan, Fukuoka Pref., May 1, 1938, by S. KATSUKI.

**) Isolation of the fungus and measurement of conidia on culture were made by Mr. Hirokuni YAMATO, Tokushima Horticultural Experiment Station, in the course of his training in our Laboratory.

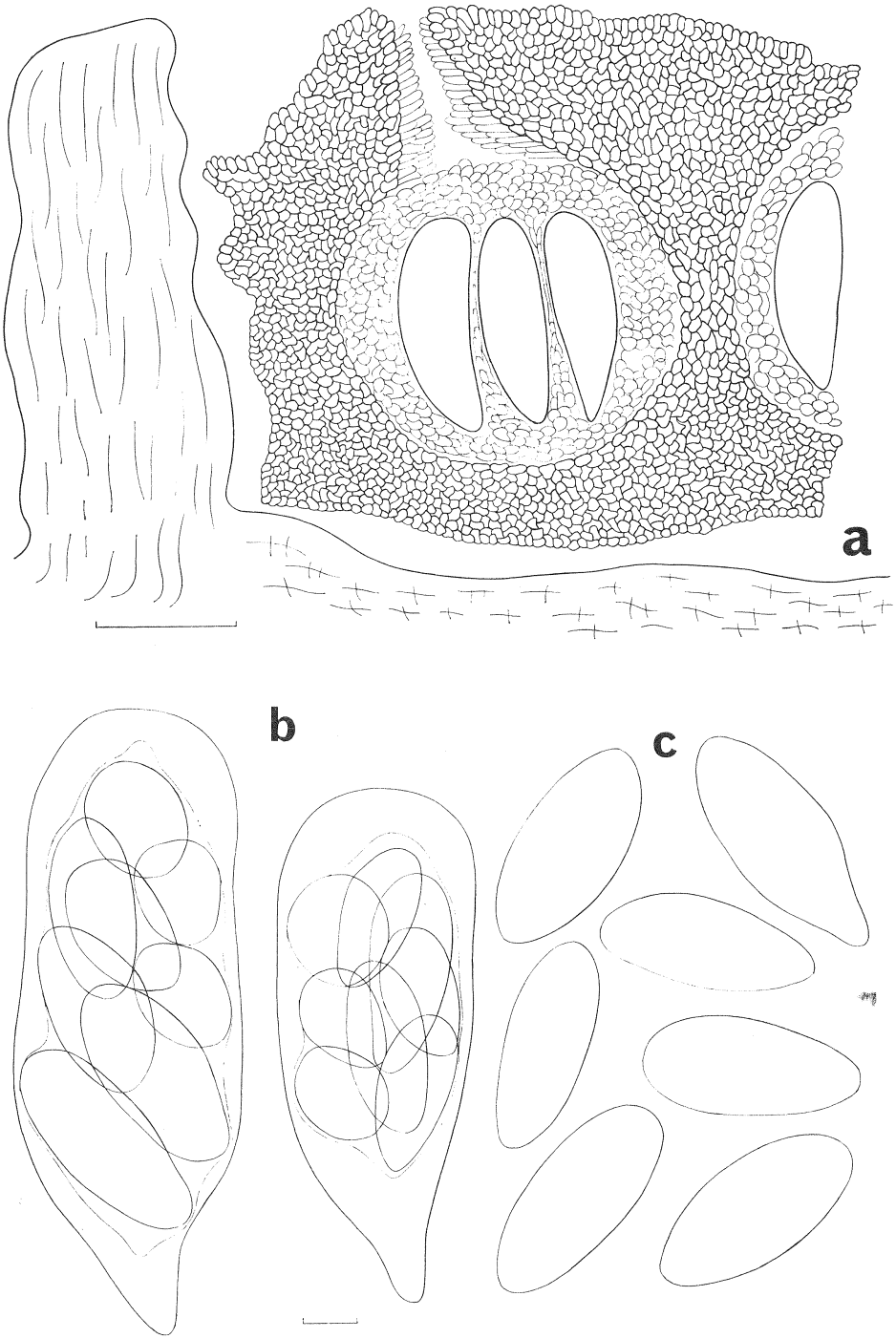

Figure 2　*Botryosphaeria melanops* (Tul.) Wint. on *Quercus myrsinaefolia*

a : A part of stroma having perithecial locules
b : Asci containing 8 ascospores irregularly bi- to tri-seriate
c : Ascospores　　(⟝=a : 100 μm ; b, c : 10 μm)

Stroma gregarious, at first immersed beneath epidermis and then erumpent, black, multilocular, composed of blackish brown to black, thick-walled, irregular-shaped and pseudoparenchymatous cells, 1～3 mm in diameter, 350～480 μm in height; locules hyaline 190～230 μm in height and 190～240 μm in diameter, with a pore at the top. Asci bitunicate, clavate, hyaline, 8-spored, 100～120×38～45 μm. Ascospores hyaline to faintly yellowish, irregularly biseriate, unicellular, elliptic to fusoid, usually rounded at the ends, 40～50×15～21.5 μm and 43.5×17.9 μm in average.

On bark of *Quercus myrsinaefolia* Bl. (Shira-kashi)—Isso.

Note : This species is probably the largest species in the genus *Botryosphaeria* and has been well known on dead bark of *Quercus* spp. (Winter 1887, Lind 1913, Shear & Davidson 1936, Shoemaker 1964, Barr 1972). It was once included in *Botryosphaeria quercuum* (Schw.) Sacc. as a synonym by Arx and Müller (1954). However, *Botryosphaeria melanops* reisolated from *B. quercuum* by Shoemaker (l. c.). His basis to isolate it from the latter are the differences of the morphology of conidial and ascigerous states. *Botryosphaeria melanops* has asci, ascospores and conidia quite larger than those of *B. quercuum*. Barr (l. c.) supported Shoemaker's treatment. Although conidial state of the materials collected from Yaku Island could not be confirmed, morphologic characteristics of the ascigerous state agreed with those of *Botryosphaeria melanops* noted by Shear and Davidson (l. c.) and Shoemaker (l. c.). The present fungus is larger than *Botryosphaeria quercuum* (Schw.) Sacc. reported by Katumoto (1966) on *Rhus succedanea*. This is the first record of the species in Japan.

7. *Colletotrichum gloeosporioides* Penzig, Fungi Agrum. **2** : 6, 1882; Arx, Phytop. Zeits. **29**(4) : 422, 1957; ——, Verh. Konik. Nederl. Akad. Wetens. & Natuurk. **5**(3) : 38, 1957; ——, Revis. of Gloeosp. (Bibl. Mycol. 24) : 59, 1970.—Figure 3; Plate 3 : A, B)

Syn. : *Colletotrichum azaleae* Ell. et Ev., Bull. Torr. Bot. Cb. **22** : 437, 1895; Saccardo, Syll. Fung. **14** : 1016, 1899.

Gloeosporium rhododendri Briosi et Cavara, Fungi Pras. No. 198; Saccardo, Syll. Fung. **11** : 565, 1895; Allescher, Rabh. Kryptgfl. I, **7** : 497, 1903; Suzuki, Jour. Pl. Prot. **3**(5) : 362, 1916; Grove, Brit. Stem- & leaf-fungi (Coelom.) **2** : 223, 1937.

Colletotrichum polyptychophyllum da Camara, Rev. Agron. **17**(2) : 10, 1929.

On *Rhododendron metternichii* var. *yakushimanum* (Nakai) Ohwi (Yakushima-shakunage)—Anbo.

Note : Spots on the upper leaf surface are at first 1～2 mm in diameter, circular, brown to dark brown, and then enlarge to 5～10 mm in diameter with many small pustules, becoming grayish brown with brown narrow border; on the lower leaf surface spots are shown as indistinct dark area.

Several records on anthracnose of *Rhododendron* have been known (Anonymous 1960, Conners 1967, Dingley 1969, Stathis & Plakidas 1958), and two records have been known in Japan. One is an introductory note on the noteworthy diseases of *Rhododendron* in foreign countries (Suzuki 1916), and *Gloeosporium rhododendri* Br. et Cav. was introduced as the cause of the anthracnose. Arx (1957a, b, 1970) treated this species as a synonym of *Colletotrichum gloeosporioides* Penz., the conidial state of *Glomerella cingulata* (Ston.) Sp. et Schr., as suggested by Weiss (1943).

The other was made by Takimoto (1939). He described the disease symptom of an anthracnose of *Rhododendron* with a photograph, but he did not mention any mycological note on the causal pathogene, *Colletotrichum azaleae* Ell. et Ev., and his basis of identification. As already

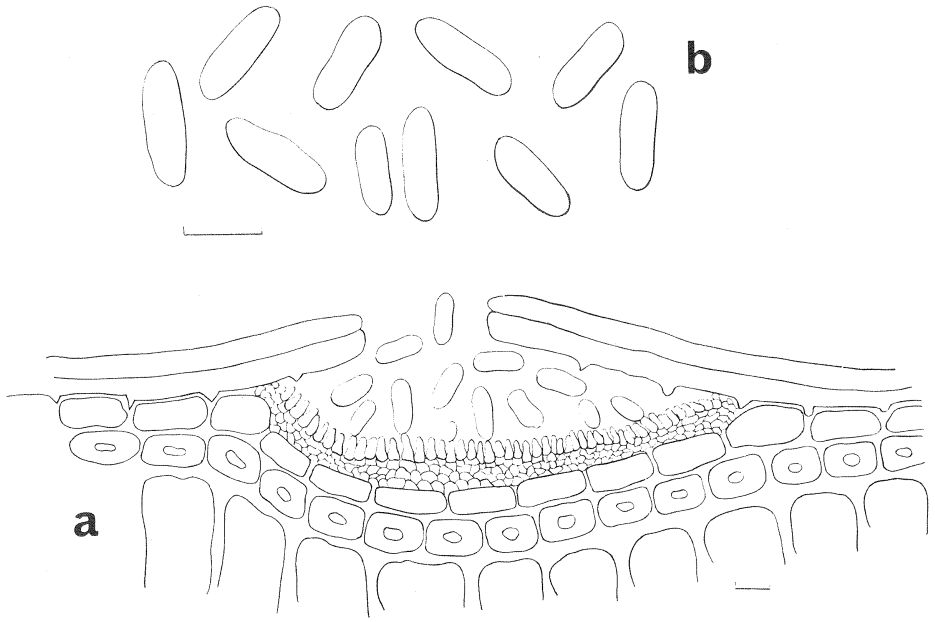

Figure 3　*Colletotrichum gloeosporioides* Penz. on *Rhododendron metternichii* var. *yakushimanum*
a : Acervulus formed beneath cuticle　b : Conidia　(⟷=10 μm)

treated by Arx (1957a), *Colletotrichum azaleae* was included in the synonyms of *C. gloeosporioides*. Dimension of the anthracnose fungus collected from Yaku Island, being 14～20×4～5.5 μm in size of conidia, accords well with Arx's concept of *Colletotrichum gloeosporioides*, and the disease symptom is quite similar to that described by Takimoto (l. c.).

According to Arx (1970), *Gloeosporium rhododendricola* Hollós may belong to the genus *Botryodiplodia* and *G. succineum* Sacc. (Saccardo 1884) to *Chrysomyxa*.

The present *Rhododendron* is a new host for this fungus.

8. *Cystotheca lanestris* (Harkn.) Miyabe in Ideta, Handb. Pl. Dis. Japan (4 th edit.) : 226, 1909; Miyake, Bot. Mag. (Tokyo) **27** : 40, 1913; Homma, Jour. Fac. Agr. Hokkaido Imp. Univ. **38**(3) : 293, 1937.—(Plate 3 : C)

Syn. : *Sphaerotheca lanestris* Harkn., New Calif. Fungi : 20, 1886; Sawada, Bull. Agr. Exp. Sta. Formosa **19** : 159, 1919 : ——, Bull. Gov. For. Exp. Sta. (Tokyo) **50** : 103, 1951.
Cystotheca lanestris (Harkn.) Sacc., Ann. Myc. **9** : 249, 1911.
Sphaerotheca kusanoi Henn. et Shirai, Engl.'s Bot. Jahrb. **29** : 147, 1901.
Cystotheca tenuis Miyabe et Takahashi, in Ideta, Pract. Phytop. : 170, 1901.

On living leaves of *Quercus salicina* Bl. (Urajiro-gashi)—Isso.

Note : According to Homma (1937), *Cystotheca lanestris* is known only on the deciduous oaks and *C. wrightii* Berk. et Curt. is only on the evergreen oaks. Besides the differences in host plants and in the shape of mycelial hairs, no remarkable characteristics to distinguish both species have been recognized. Hairs of *Cystotheca wrightii* are stout, crescent or falcate in shape, deep brown in color, and are 120～170×5～7.5 μm in size*). On the other hand, those

*) On *Quercus myrsinaefolia* Bl. (Shira-kashi)—Mt. Myogi, Gunma Pref., XII-22, 1972, by K. Sato (TFN : FPH-3801).

of *Cystotheca lanestris* are slender, needle-shaped, somewhat curved, light brown in color and are 175～250×3.5～5μm in size. Though the present powdery mildew fungus was collected on an ever-green oak, it is provisionally identified as *Cystotheca lanestris* based on its slender hairs 175～250×3.5～5μm in size.

9. *Discosia deflectens* Sacc., Mich. **2** : 145, 1882; ——, Syll. Fung. **3** : 1055, 1884.—(Plate 3 : D～F)

Spots circular, grayish brown to whitish gray with brown to dark brown border, 5～10 mm in diameter, scattered many blackish points. Conidial layer or pycnidia epiphyllous, black, disk like, with black coriaceous shell, 135～150μm in diameter, 45～50μm in height; shell opening widely at maturing stage. Conidia densely arranged in parallel at the bottom of the pycnidium, hyaline to pale yellowish, 4-celled, inaequilateral or slightly curved, 15～19×2.5～3μm in size, median two cells cylindrical, both end cells conical with each one appendage at their abdominal parts. Appendages hyaline, cilium-like, 7.5～10μm in length.

On living leaves of *Ilex buergeri* Miq. (Shii-mochi)—Miyanoura.

Note : On *Ilex* plants two species of *Discosia* have been known from North America, namely *D. minima* Berk. et Curt. (Saccardo 1884) and *D. deflectens* Saccardo (1884). *Discosia minima* has large conidia, 36～37μm in length, and is quite different from the present fungus. On the other hand, the morphology of the *Discosia* collected from Yaku Island is quite accordant with the description of *D. deflectens* Sacc. This is the first record of *Discosia deflectens* in Japan and *Ilex buergeri* is a new host for the fungus.

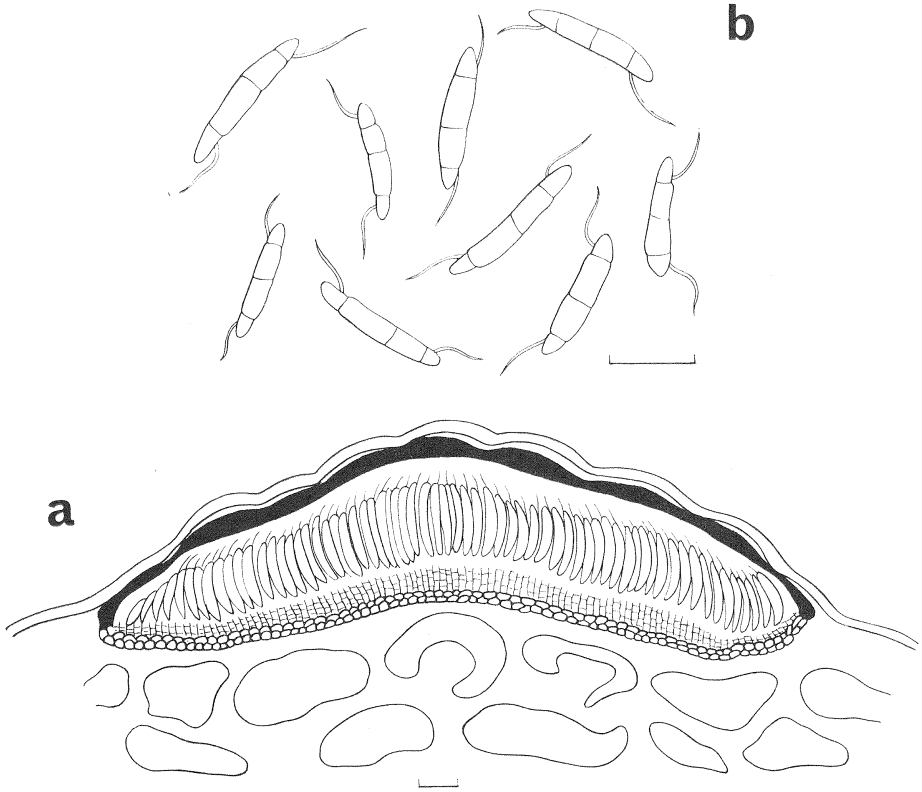

Figure 4 *Discosia artocreas* (Tode) Fries on *Quercus salicina*
a : Unbroken conidial layer (pycnidium)　b : Conidia　(⊢⊣=10μm)

10. *Discosia artocreas* (Tode) Fries, Sum. Veg. Scand. : 423, 1849; Saccardo, Syll. Fung. **3** : 653, 1884; Allescher, Rabh. Kryptgfl. I, **7** : 377, 1903; Hara, Bot. Mag. (Tokyo) **27** : 67, 1913; Grove, Brit. Stem- & leaf-fungi (Coelom.) **2** : 189, 1937.—(Figure 4; Plate 4 : A, B)

Pycnidia or conidial layers hypophyllous, gregarious, black, disc like with black coriaceous shell, 115～500 μm in diameter, 40～50 μm in height; shell opening widely in maturing stage. Conidia densely arranged in parallel at the bottom of pycnidium, hyaline to pale yellowish, 4-celled, rounded at the ends, 15～20×2.5～3 μm in size, with two appendages at the abdominal part of each end cell. Appendages hyaline, cilium like, 5～10 μm in length.

On dead leaves of *Quercus salicina* Bl. (Urajiro-gashi)—Anbo.

Note : The present fungus was found on the newly felled trees. Masses of black, disc-like pycnidia are found on the lower leaf surface. On *Quercus* only one species of *Discosia*, *D. artocreas* (Tode) Fries (Saccardo 1884, Allescher 1903, Grove 1937), has been known. This may be a collective species having wide host range, such as *Betula*, *Carpinus*, *Prunus*, *Rhamnus* etc. Morphology of the present *Discosia* is identical with that of *D. artocreas*. This species has been recorded on *Pyrus* in Japan (Hara 1913).

11. *Endophyllum machili* (Henn.) Stevens, Univ. Nat. Appl. Sci. Bull. **2** : 442, 1932; Hiratsuka & Kaneko, Abst. Proc. 19 th. Ann. Meet. Myc. Soc. Japan : **24**, 1975; ——, —— & Ohira, Rept. Tottori Myc. Inst. **12** : 64, 1975.

Syn. : *Aecidium machili* Henn., Hedw. **41** : 21, 1902; Morimoto, Jour. Jap. Bot. **28**(10) : 316, 1953; Katsuki, Jour. Jap. Bot. **31**(12) : 370, 1955; Hiratsuka, Mem. Fac. Agr., Tokyo Univ. Educ. **1** : 87, 1952; ——, Shimabukuro & Sato, Bull. Sci. Agr. & Home Econ. Div., Univ. Ryukyus **2** : 57, 1955.

On living leaves of *Machilus thunbergii* Sieb. et Zucc. (Tabunoki)—Kurio; *M. japonica* Sieb. et Zucc. (Hosoba-tabu)—Kurio, Miyanoura, Isso.

Note : This species has long been known as *Aecidium machili* Henn. in Japan. Recently, Hiratsuka and Kaneko (1975) accepted Stevens' revision of the fungus after their detailed life-historical and cytologic studies, and, therefore, the species name of the fungus was altered to *Endophyllum machili* (Henn.) Stev.

12. *Endothia macrospora* Kobayashi et Ito, Ann. Phytop. Soc. Japan **21** : 152, 1956; —— & ——, Bull. Gov. For. Exp. Sta. (Tokyo) **92** : 95, 1956; Kobayashi, Bull. Gov. For. Exp. Sta. (Tokyo) **226** : 145, 1970.—(Plate 4 : C, D)

On bark of *Quercus salicina* Bl. (Urajiro-gashi)—Kurio.

Note : This evergreen oak is a new host for the fungus.

13. *Endothia nitschkei* Otth, Mitt. Nat. Ges. Bern, 1868 : 8; Kobayashi, Bull. Gov. Exp. Sta. (Tokyo) **226** : 143, 1970.

Syn. : *Endothia japonica* Kobayashi et Ito, Ann. Phytop. Soc. Japan **21** : 15, 1956; —— & ——, Bull. Gov. For. Exp. Sta. (Tokyo) **92** : 94, 1956.

On bark of *Quercus myrsinaefolia* Bl. (Shira-kashi)—Isso.

Note : This evergreen oak is a new host for the fungus.

14. *Hypoderma insularis* Kobayashi, Mem. Nation. Sci. Mus. **9**, 1976.

On needles of *Tsuga sieboldii* Carr. (Tsuga)—Anbo.

15. *Hypoxylon nummularium* var. *australe* (Cke.) Miller, Monogr. Hypoxylon : 123, 1961; Hino & Katumoto, Bull. Fac. Agr., Yamaguchi Univ. **16** : 611, 1965.—(Plate 4 : E; Plate 5 : A～C)

Stromata at first immersed beneath the epidermis, then erumpent, applanate, dark brown to dull black or black, carbonous, irregular and varied in their size, 0.5～1 mm in thickness,

ornamented with numerous minute papillae. Perithecia immersed the stromata, numerous, subglobular to depressed, 300 μm in height and 100～200 μm in diameter. Asci cylindric, numerous, 8-spored, 113～128×10～11.5 μm, distinctly blued with iodine at their tip. Ascospores uniseriate, brown to chestnut brown, elliptic to fusoid, somewhat acute at the ends, with longitudinal germ slit at their abdomen, 14～17.5×7.5～10 μm.

On dead trunk of undetermined species of a broad-leaved trees—Kurio.

Note : The present *Hypoxylon* belongs to Section Applanata in the genus *Hypoxylon* after MILLER's concept (1961), and it is identified as *H. nummularium* var. *australe* by its sizes of asci and ascospores. In Japan, HINO and KATUMOTO (1965) reported this species on *Quercus salicina* and *Castanopsis cuspidata* var. *sieboldii* from Amami Islands, about 200 km south from Yaku Island. Dimensions of asci and ascospore in the present specimen are somewhat narrower than those of specimens collected by HINO and KATUMOTO.

16. *Leptostroma* sp.

On living leaves of *Neolitsea aciculata* (THUNB.) KOIDZ. (Inu-gashi)—Kurio.

Note : No species of *Leptostroma* has been known on *Neolitsea* and the other Lauraceae plants. Pycnidia of the fungus are formed on the brown marginal spot of the leaves. They are subcuticular, black, 140～180 μm in diameter and are 20～30 μm in height. Conidia are hyaline unicellular, minute cylindric or sausage-shaped, somewhat curved, and are 2～4×0.8～1.3 μm in size.

17. *Mycosphaerella cryptomeriae* SHIRAI et HARA, Jour. Plant Prot. **5** : 40, 1918; SAWADA, Bull. Gov. For. Exp. Sta. (Tokyo) **45** : 34, 1950; ITO et al., Bull. Gov. For. Exp. Sta. (Tokyo) **52** : 121, 1952.

On needles of *Cryptomeria japonica* D. DON (Sugi)—Kurio, Anbo, Miyanoura.

18. *Mycosphaerella cleyerae* KOBAYASHI, Mem. Nat. Sci. Mus. (Tokyo) 9, 1976.

On living leaves of *Cleyera japonica* THUNB. (Sakaki)—Anbo.

19. *Mycosphaerella yaku-insularia* KOBAYASHI, sp. nov.—(Figure 5; Plate 5 : D, E)

Maculis in foliis vivis, marginalis, semiorbicularibus, 5～30 mm magnitudinis, seape coalescens; pseudotheciis amphigenis, numerosis, nigris, disseminatis, subglobosis, 60～75 μm altis, 53～75 μm latis; paries membranaceis, 5～10 μm crassis; ascis fasciculatibus, subclavatis, octospotis, bitunicatis, 23～33×7.5～9 μm; ascosporis hyalinis, 2- vel 3-seriatis, anguste ovatis, 1-septatis, cellulis inferioribus leniter parvulis, 9～11.5×2.5～3 μm.

Hab. on living leaves of *Ilex buergeri* MIQ. (Shii-mochi)—Nagata (Type in TMN.)

Note : This fungus causes a leaf blotch disease of *Ilex buergeri*. On *Ilex*, 4 species of *Sphaerella* (=*Mycosphaerella*) have hitherto been described. Among them, *Sphaerella ilicella* CKE. (SACCARDO 1882) and *S. prini* CKE. (SACCARDO 1883) are apparently distinguished from the present *Mycosphaerella* by their quite large or quite small sizes of ascospores. The other two, *Mycosphaerella ilicis* (ELL.) JOHANS. (SACCARDO 1883, ELLIS & EVERHART 1892; SANDU-VILLE 1971) and *Sphaerella ilicicola* MAUBL. (SACCARDO 1913), are somewhat similar to the present fungus. According to HARA (1923), *Mycosphaerella ilicis* causes the leaf spot of *Ilex pedunculosa* and *Ligustrum japonicum* in Japan. However, the fungus on *Ilex buergeri* differs from *Mycosphaerella ilicis* and *Sphaerella ilicicola* by its small asci and ascospores. As no other species of *Sphaerella* or *Mycosphaerella* has been found on *Ilex*, the fungus collected from Yaku Island is treated as a new species of the genus *Mycosphaerella*.

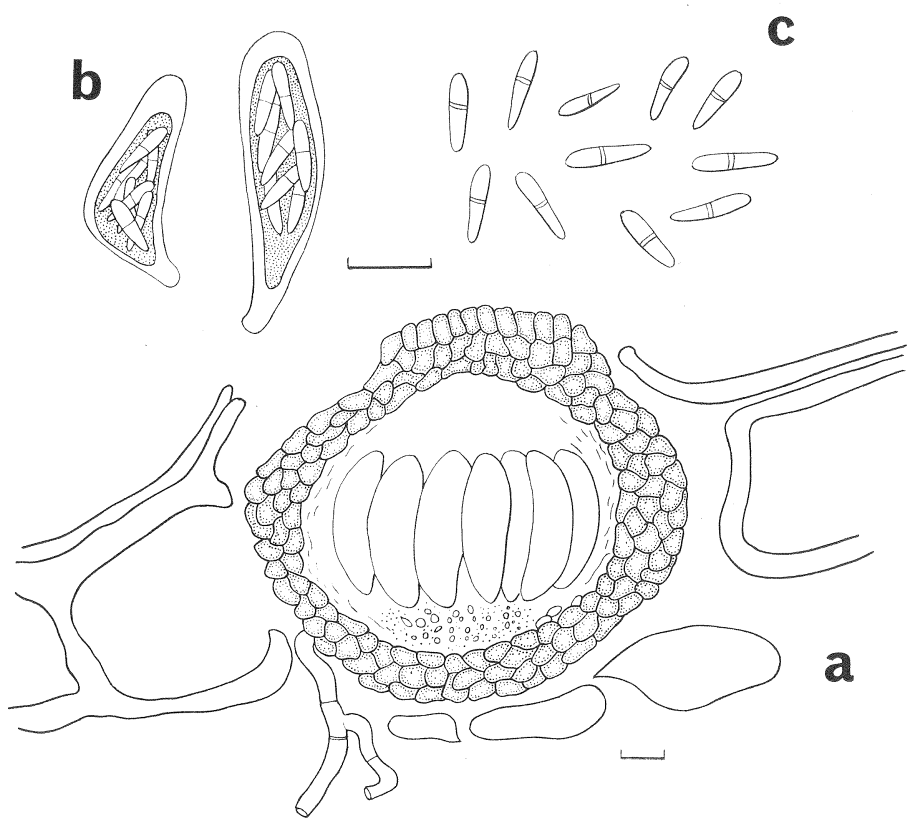

Figure 5　*Mycosphaerella yaku-insularis* Kobayashi, sp. nov. on *Ilex buergeri*
a : Pseudothecium　b : Asci irregularly containing 8 ascospores
c : Ascospores　(⊢⊣=10 μm)

20. *Pestalotiopsis adusta* (Ell. et Ev.) Steyaert, Trans. Brit. Myc. Soc. **36** : 82, 1953.—(Figure 6; Plate 6 : A, B)

Syn. : *Pestalotia adusta* Ell. et Ev., Jour. Myc. **4** : 51, 1888; Saccardo, Syll. Fung. **10** : 486, 1892; Guba, Monochaetia & Pestalotia : 117, 1961.

Pestalotia bischofiae Sawada, Rept. Agr. Exp. Sta. Formosa **85** : 84, 1943.

Spots circular or semicircular at the marginal area, 5～10 mm in diameter, grayish brown to light brown with dark brown border, often formed a few brownish concentric zones, scattered black pustules. Acervuli amphigenous, mostly epiphyllous, black, minute, 140～150 μm in diameter, immersed within epidermis and mesophyll, then open widely by breaking through epidermis. Conidia densely arranged in parallel at the bottom of acervulus, 5-celled, oblong or elliptic-fusoid, erect, 15～20×5～6.5 μm; intermediate colored cells pale olivaceous, 11.5～14.5 μm in length, concolorous or somewhat darker at the upper two cells, hardly constricted at the septa; exterior cells hyaline, apical cells short conic bearing 2- or 3-setulae; setulae cillium like, 4～10 μm in length, often branched; basal cells short, obconic, having one pedical at the tip; pedicels 1.5～4 μm in length.

On living leaves of *Hydrangea luteo-venosa* Koidz. (Ko-gaku-utsugi)—Miyanoura.

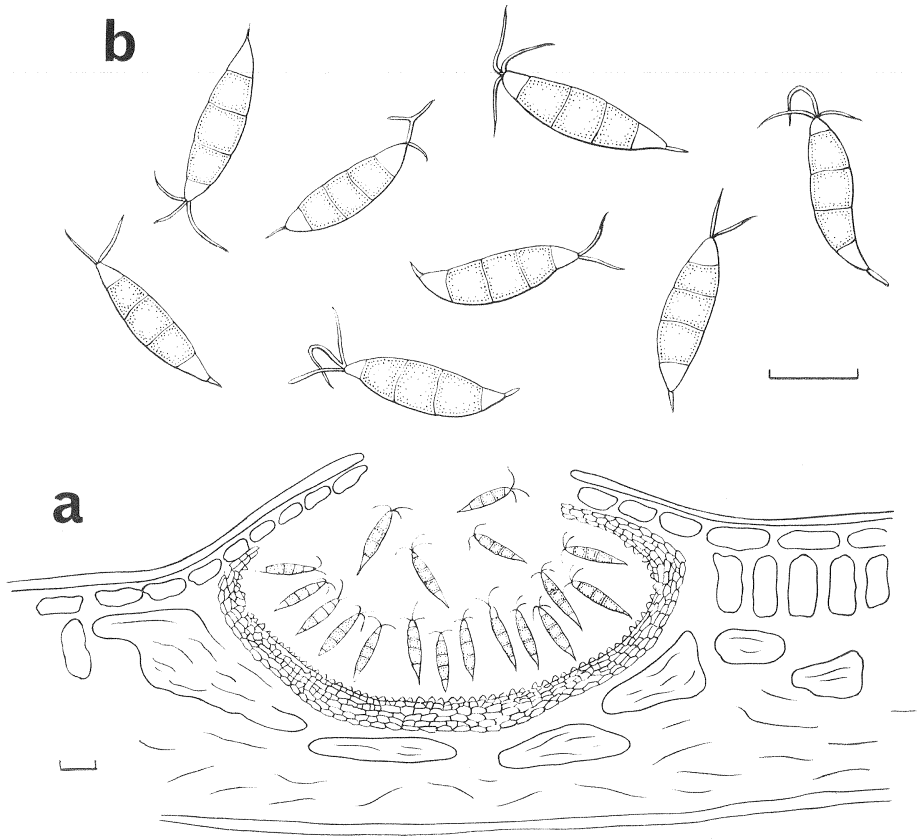

Figure 6　*Pestalotiopsis adusta* (Ell. et Ev.) Steyaert on *Hydrangea luteo-venosa*

a : Acervulus showing pseudopycnidium-type　b : Conidia　(⊢—⊣ = 10 μm)

Note : On *Hydrangea* no species of *Pestalotia* sensu Guba has been described. According to Guba's monograph of the genus *Pestalotia* (1961), the present fungus is included in the group Non-spathulatae of section Quinquiloculatae, and it is identified as *Pestalotia adusta* Ell. et Ev. by its conidial morphology.

Steyaert (1949) raised section Quinquiloculatae Klebahn to the genus rank and established a new genus *Pestalotiopsis*. At that time, *Pestalotia adusta* had not been accepted in the genus *Pestalotiopsis*. Later, Steyaert (1953) added several species of *Pestalotia* including *P. adusta* Ell. et Ev. to his genus *Pestalotiopsis*. Though Guba denied Steyaert's treatment and maintained section Quinquiloculatae in the genus *Pestalotia*, many mycologists have tended to follow Steyaert's sense.

Guba (1961) treated *Pestalotia mume* Hori and *P. bischofiae* Sawada as the synonyms of *Pestalotia adusta*, based on his examinations of Japanese and Formosan specimens. However, it is quite doubtful that *Pestalotia mume* Hori was published. None of this species name has been found in any Japanese literatures including Hori's "Shokubutsu-byogai-kowa 2, 1916" cited by Guba (l. c.).

21. *Phyllosticta cryptomeriae* KAWAMURA, Bull. Gov. For. Exp. Sta. (Tokyo) **10** : 97, 1913; KOBAYASHI & SASAKI, Trans. Myc. Soc. Japan **16**(3) : 234, 1975.

Syn. : *Phoma cryptomeriae* auct, in KASAI, Inst. Jap. Nat. Railw. Res. Materials **2**(7) : 553, 1914; HARA, Jour. Pl. Prot. (Tokyo) **11** : 507, 1924; SAWADA, Bull. Gov. For. Exp. Sta. (Tokyo) **50** : 42, 1950; ITO, et al., Bull. Gov. For. Exp. Sta. (Tokyo) **52** : 84, 1952.

On needles of *Cryptomeria japonica* D. DON (Sugi)—Miyanoura, Anbo.

22. *Phyllosticta multimaculans* KOBAYASHI, sp. nov.—(Plate 6 : C)

Maculis in foliis vivis, minutis, numerosis, plus quam 100 ad folium, orbicularibus, 0.5～2 mm in diam., disseminatis, nigris vel atrobrunneis; pycnidiis 1-3-aggregatis, immersis, dein erumpentibus, subglobosis, 90～110 μm in diam.; paries parenchymaticis, nigris, 5 μm in crassis; conidiophoris hyalinis, conicis, 5～7.5×2.5 μm; conidiis hyalinis, continuis, ovoideis vel ellipticis, 7.5～9.5×4.5～5.5 μm, cum obscure appendiculatis ad apicem.

Hab. on living leaves of *Lindera citriodora* (SIEB. et ZUCC.) HEMSL. (Aomoji)—Nagata (Type in TMF).

Note : On *Lindera* four species of *Phyllosticta* have been known. Among them *Phyllosticta linderae* ELL. et EV., which was recorded from Japan by TOGASHI and ONUMA (1934), TOGASHI (1936) and MIURA (1957, 1962), and *P. lindericola* ELL. et EV. (SACCARDO 1895) are different from the present fungus by their quite small conidia. *Phyllosticta kuromoji* MIURA (1957) is distinguishable from the fungus under consideration by its shape and size of conidia. *Phyllosticta phanerura* AA (1973) is also different from the present *Phyllosticta* by its large size of conidia. As no other species identical with the present *Phyllosticta* has been found on *Lindera*, it is described as a new species.

23. *Plagiosphaera quercicola* KOBAYASHI, Mem. Nation. Sci. Mus. **9**, 1976.

On dead leaves of *Quercus salicina* BL. (Urajiro-gashi)—Anbo.

24. *Plagiostigme neolitseae* KOBAYASHI, Mem. Nation. Sci. Mus. (Tokyo) **9**, 1976.

On living leaves on *Neolitsea aciculata* (BL.) KOIDZ. (Inu-gashi)—Isso, Kurio.

25. *Plectosphaera actinodaphneae* KOBAYASHI, Mem. Nation. Sci. Mus. (Tokyo) **9**, 1976.

On living leaves of *Actinodaphne longifolia* (BL.) NAKAI (Baribarinoki)—Nagata.

26. *Rhytisma ilicis-latifoliae* HENN., Monsunia **1** : 29, 1899; SACCARDO, Syll. Fung. **16** : 790, 1902.

On living leaves of *Ilex integra* THUNB. (Mochinoki)—Isso.

27. *Septoria corni-controversae* SAWADA, Bull. Gov. For. Exp. Sta. (Tokyo) **105** : 58, 1958.

On living leaves of *Cornus brachypoda* C. A. MEY (Kumano-mizuki)—Kurio.

28. *Septoria rubi* WEST., in SACCARDO, Syll. Fung. **3** : 486, 1884; TOGASHI & ONUMA, Bull. Coll. Agr. & For. Morioka **17** : 43, 1934; GROVE, Brit. Stem- & leaf-fungi (Coelom.) **1** : 405, 1935.—(Figure 7; Plate 6 : D, E)

Syn. : *Septoria rubi* var. *asiatica* BUBÁK, in Handet-Mazzetti, Ann. Naturhist. Hofmus. Wien **23** : 105, 1909; SACCARDO, Syll. Fung. **22** : 1094, 1913.

Septoria campoi SPEG., Bol. Acad. Nac. Cienc. Cordoba **25** : 108, 1921; SACCARDO & TROTTER, Syll. Fung. **26** : 1139, 1972.

Septoria rubicola SAWADA, Bull. Gov. For. Exp. Sta. (Tokyo) **105** : 67, 1958.

Spots at first 1～3 mm in diameter, circular and brown to grayish brown, with dark brown border, then enlarged to 5 mm in size and irregular in shape, bordered by nerves, becoming grayish white at central part, with yellowish green around the spots. Pycnidia mostly epiphyllous, scattered, dark brown to black, immersed in epidermis and mesophyll, then erumpent, subglobular, 70～95 μm in height and 75～90 μm in diameter, widely opened at maturing stage ;

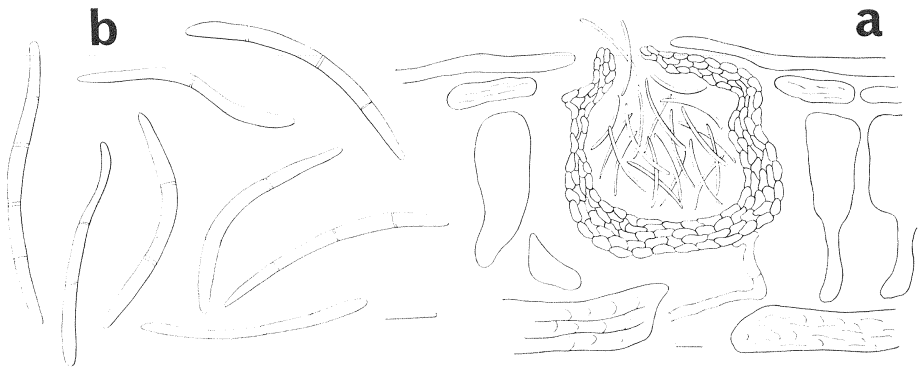

Figure 7 *Septoria rubi* West. on *Rubus Crataegifolius*
a : Pycnidium d : Conidia (⊢—⊣=10 μm)

pycnidial wall brown to dark brown, 7.5～10μm in thickness. Conidia hyaline, cylindric, irregularly curved, rounded at both ends, 35～50×2～3μm, with 2～5 septa.

On living leaves of *Rubus crataegifolia* Bunge (Kuma-ichigo)—Nagata, Anbo.

Note : On Rubus plants 4 species including 2 varieties of *Septoria* have been known. Morphology of the present *Septoria* is identical with that of *S. rubi* West. reported by Saccardo (1884), Togashi and Onuma (1934) and Grove (1935). No essential differences have been found among the morphologic characteristics of *Septoria rubi* var. *asiatica* Bub. (Saccardo 1913), *S. campoi* Speg. (Saccardo & Trotter 1972) and *S. rubicola* Sawada (1958 non Hollós 1926). Therefore, these species and variety are treated as the synonyms of *Septoria rubi* West. *Rubus crataegifolia* is a new host for this fungus.

29. *Sphaceloma rhois* Bitanc. et Jenk., Arq. Inst. Biol. (Sao Paulo) **11** : 48, 1940; Katsuki, Kyushu Agr. Res. **12** : 53, 1953; Hashimoto, Jour. Jap. For. Soc. **41**(6) : 239, 1959.

On living leaves and young shoots of *Rhus succedanea* L. (Haze)—Miyanoura.

30. *Sphaerognomonia haraeana* Kobayashi, Bull. Gov. For. Exp. Sta. (Tokyo) **226** : 153, 1970.

Syn. : *Gnomoniella*(?) sp., in Ito et al., Bull. Gov. For. Exp. Sta. (Tokyo) **52** : 82, 1952.

On needles of *Cryptomeria japonica* D. Don (Sugi)—Miyanoura.

31. *Trematosphaeria yakushimensis* Kobayashi, Mem. Nation. Sci. Mus. (Tokyo) **9**, 1976.

Conidial state : *Hendersonula yakushimensis* Kobayashi.

On living leaves of *Symplocos theophrastaefolia* Sieb. et Zucc. (Kanzaburo-no-ki)—Kurio.

32. *Vestergrenia daphniphylli* Kobayashi, Mem. Nation. Sci. Mus. (Tokyo) **9**, 1976.

On living leaves of *Daphniphyllum teijismanni* Zoll. (Hime-yuzuriha)—Miyanoura, Kurio.

Characteristics of geographic distribution in the fungi collected from Yaku Island

1. Number of fungal species inhabiting woody plants in Yaku Island

As shown in Table 1, numbers of fungi parasitic to woody and vine plants, which have hitherto been collected from Yaku Island, amount to 165 species belonging to 75 genera. Among them 56 species of 31 genera belong to Ascomycetes and 61 species of 20 genera to Fungi Imperfecti. Almost all of species belonging to Basidiomycetes, recorded as 46 species of 22

Table 1. Fungous genera and number of species recorded on woody and vine plants in Yaku Island

Genus	Species	Genus	Species	Genus	Species
Aciculosporium	1	*Helminthosporium*	1	*Phyllosticta*	9
Aecidium	4	*Hemileia*	1	*Physalospora*	3
*Albomyces**)	1	*Hendersonula***)	1	*Pileolaria*	2
Amazonia	1	*Hypoderma*	1	*Plagiosphaera*	1
Ascochyta	1	*Hypoxylon*	1	*Plagiostigme*	1
Asterina	5	*Irene*	1	*Plasmopara*	1
Aulographum	1	*Irenina*	2	*Plectosphaera*	2
Botryosphaeria	2	*Kmetia*	1	*Pseudocercospora*	1
Cercospora	30	*Kuhneola*	2	*Puccinia*	3
Clasterosporium	1	*Lembocina*	1	*Pucciniastrum*	6
Coleopucciniella	1	*Leptosphaeria*	1	*Rhinotrichum*	1
Coleosporium	5	*Leptothyrium*	1	*Rhytisma*	3
Colletotrichum	2	*Lophodermium*	1	*Septobasidium*	1
Crossopsora	1	*Macrophoma*	1	*Septoria*	3
Cystotheca	1	*Melampsora*	2	*Sphaceloma*	2
Diplodina	1	*Meliola*	4	*Sphaerognomonia*	1
Discosia	2	*Micropeltis*	2	*Sphaerotheca*	1
Echidnodella	1	*Mycosphaerella*	6	*Synchytrium*	1
Elsinoe	2	*Ochropsora*	1	*Trematosphaeria*	1
Endophyllum	1	*Oidium*	1	*Trochophora*	1
Endothia	2	*Pestalotia****)	3	*Uredo*	2
Exobasidium	1	*Phakopsora*	5	*Uromyces*	2
Ganoderma	1	*Phragmidium*	2	*Ustilago*	1
Gerwasia	1	*Phyllachora*	3	*Vestergrenia*	1
Hamaspora	1	*Phyllactinia*	1	*Xenostele*	1

Total : 75 genera, 165 species (Phycomycetes : 2 genera, 2 species; Ascomycetes : 31 genera, 56 species; Basidiomycetes : 22 genera, 46 species; Fungi Imperfecti : 20 genera, 61 species)

*) Conidial state of *Aciculosporium*　**) Conidial state of *Trematosphaeria*　***) GUBA's sense (1961)

genera, are of Uredinales causing rust diseases. Only 2 species of 2 genera belonging to Phycomycetes have been recorded.

2. Fungi recorded only from Yaku Island

KATSUKI (1955b) listed 5 species inhabiting woody plants as indigenous to Yaku Island. Since that time, 22 species were added to the indigenous fungous flora of the Island. As 2 of them, *Asterina distyliicola* HINO et KATUMOTO (1956, KATUMOTO 1975) and *Aulographum symplocacearum* HINO et KATUMOTO (KATUMOTO 1958, and see the footnote of page 2), were lately collected in the more northern regions than Yaku Island, the following 25 species are listed to be indigenous :

Ascochyta yakushimensis KOBAYASHI (1976), *Asterina yakusimensis* KATUMOTO (1975), *Cercospora yakushimensis* TOGASHI et KATSUKI (1952), *Diplodina pseudosasae* HINO et KATUMOTO (1957), *Echidnodella rapaneae* HINO et KATUMOTO (1957), *Helminthosporium desmodii* TOGASHI et KATSUKI (1957), *Hypoderma insularis* KOBAYASHI (1976), *Irene buxi* HINO et KATUMOTO (1956), *Leptosphaeria buddlejae* HINO et KATUMOTO (1957), *Meliola australis* HINO et KATUMOTO (1957), *M. tanakaeana* HINO et

KATUMOTO (1957), *Micropeltis fumosa* HINO et KATUMOTO (1957), *M. yakusimensis* HINO et KATUMOTO (1957), *Mycosphaerella cleyerae* KOBAYASHI (1976), *M. yaku-insularis* KOBAYASHI (1976), *Phyllosticta multimaculans* KOBAYASHI (1976), *P. tremae* KATSUKI (1953), *Plagiosphaera quercicola* KOBAYASHI (1976), *Plagiostigme neolitseae* KOBAYASHI (1976), *Plectosphaera actinodaphneae* KOBAYASHI (1976), *P. yakusimensis* HINO et KATUMOTO (KATUMOTO 1965), *Trematosphaeria yakushimensis* KOBAYASHI (1976), *Uredo horikawai* MORIMOTO (1953), *U. yakushimensis* MORIMOTO (1953), *Vestergrenia daphniphylli* KOBAYASHI (1976).

These are calculated as about 15% of the total number of fungi inhabiting woody plants in Yaku Island.

3. Fungi recorded from the northern area than Yaku Island

Twenty species of fungi parasitic to woody plants have been recorded from Yaku Island and more northern area than Yaku Island. Among them *Cercospora horikawai* TOGASHI et KATSUKI (1952), a synonym of *C. riachueli* SPEG. (KATSUKI 1965), was recently known to distribute more southern regions than Yaku Island. Therefore, number of fungi having their most southern delimitation in this Island is 19, and its rate against the total number of wood inhabiting fungi recorded in Yaku Island is about 12%. These fungi are as follows :

Asterina distyliicola HINO et KATUMOTO (KATUMOTO 1975), *A. ligustri* HENNINGS (KATUMOTO 1975), *Aulographum symplocacearum* HINO et KATUMOTO (page 2), *Cercospora hederae* TOGASHI et KATSUKI (KATSUKI 1965), *C. obtegens* SYDOW (KATSUKI 1955b), *C. violamaculans* FUKUI (KATSUKI 1965), *Colletotrichum morifolium* HARA (KATSUKI 1955b), *Lombacina nipponica* KATUMOTO (1975), *Leptothyrium yoshinagai* HENN. (KATUMOTO 1975), *Mycosphaerella daphniphylli* SYD. et HARA (KATSUKI 1955a), *Ochropsora nambuana* (HENN.) DIET. (KATSUKI 1955a, HIRATSUKA et al. 1955), *Phyllachora phyllostachydis* HARA (KATSUKI 1955a, HINO et KATUMOTO 1958), *Physalospora japonica* TOGASHI (KATSUKI 1955a), *Puccinia buxi* de CAND. (MORIMOTO 1953, KATSUKI 1955a. HIRATSUKA et al. 1955), *Pucciniastrum corni* DIET. (KATSUKI 1955a, HIRATSUKA et al. 1955), *P. kusanoi* DIET. (KATSUKI 1955a), *Rhytisma shiraiana* HEMMI et KURATA (KATSUKI 1955a), *Uromyces amurensis* KOMAROV (KATSUKI 1955a), *Xenostele sakamotoi* (HIRAT. et YOSHIN.) ITO et MURAYAMA (MORIMOTO 1953, KATSUKI 1955a, HIRATSUKA et al. 1955).

4. Fungi recorded from the southern area than Yaku Island

Twenty-two fungi inhabiting woody plants have been recorded up to the present, as having their most northern delimitation in Yaku Island. Among them, 2 species, *Cercospora buddlejae* YAMAMOTO*) and *Pucciniastrum actinidiae* HIRATSUKA (HIRATSUKA et al. 1955), are recently known to distribute more northern area than Yaku Island. Therefore, 20 fungi, about 12% against the total number of the wood inhabiting fungi in Yaku Island, distribute in the southern area than Yaku Island but not in the northern one. These fungi are as follows :

Amazonia peregrina (SYD.) SYD. (HINO & KATUMOTO 1956), *Asterina elaeocarpi* SYD. (HINO & KATUMOTO 1956, KATUMOTO 1975), *Cercospora kadsurae* TOGASHI et KATSUKI (1952, KATSUKI 1965), *C. premnae* CASTEL. (KATSUKI 1953), *C. taihokuensis* SAWADA (KATSUKI 1953, 1965), *C. trilobi* CHUPP (KATSUKI 1965), *Crossopsora malloti* (RACIB.) CUMM. (KATSUKI 1953), *Ganoderma fornicatum* (FR.) PAT. (KATUMOTO 1958), *Irenina mauca* (ELL. et MART.) STEV. (KATSUKI 1953), *I. viburni* (SYD.) STEV. (KATSUKI 1953), *Kmetia ampelopsidis* SAWADA (KATSUKI 1953), *Macrophoma musae* (CKE.) BERL. et VOGL.**) (KATSUKI 1953), *Meliola formosensis* YAMAMOTO (KATSUKI 1953, KATUMOTO 1966), *M. hederae*

*) On *Buddleja venenifera* MAKINO (Urajiro-fuji-utsugi)—Kitakyushu-city, Fukuoka Pref., Sept. 19, 1975, by S. OGAWA (TMF). (OGAWA & KOBAYASHI unpublished data).

**) HEMMI and KURATA (1934) reported this fungus from Kyoto and Osaka on banana fruits imported from tropical countries.

YAMAMOTO (KATSUKI 1955), *Phakopsora malloti* (RACIB.) CUMM. (HIRATSUKA et al. 1955), *Phyllachora fici-wightianae* SAWADA (KATSUKI 1953), *Phyllosticta glochidionis* SAWADA (KATSUKI 1953), *Physalospora erycibes* SAWADA (HINO & KATUMOTO 1957), *P. morindae* KOORD. (KATSUKI 1953), *Pileolaria pistasiae* TAI et WEI (KATSUKI 1953, HIRATSUKA et al. 1955).

As noted above, 24% of the fungi parasitic to the woody plants in Yaku Island, total of each 12% of the fungi having the northern or the southern origins, have most northern or most southern delimitation of their distribution in Yaku Island.

Enumeration list of the fungi parasitic to woody and vine plants in Yaku Island

1. *Aciculosporium take* MIYAKE, (32)*), on *Phyllostachys aurea* (Kure-take).
2. *Aecidium araliae* SAWADA, (33), on *Schefflera octophylla* (Fukanoki)
3. *A. elaeagni* DIET., (33), on *Elaeagnus maritima* (Akaba-gumi)
4. *A. mori* BARCL., (28), on *Morus bombycis* (Yama-guwa)
5. *A. rhaphiolepidis* SYD., see page 2.
6. *Albomyces take* MIYAKE, conidial state of *Aciculosporium take.*
7. *Amazonia peregrima* (SYD.) SYD., (20), on *Maesa tenera* (Shima-izu-senryô)
8. *Ascochyta yakushimensis* KOBAYASHI, see page 2.
9. *Asterina daphniphylli* YAMAMOTO, (39), on *Daphniphyllum teijismanni* (Hime-yuzuriha)
10. *A. distyliicola* HINO et KATUMOTO, (20) (39), on *Distylium racemosum* (Isunoki)
11. *A. elaeocarpi* SYD., (20) (39), on *Elaeocarpus sylvestris* var. *ellipticus* (Horutonoki)
12. *A. ligustri* HENN., (35) (39), on *Ligustrum japonicum* (Nezumi-mochi)
13. *A. yakusimensis* KATUMOTO, (39), on *Pittosporum tobira* (Tobera)
14. *Aulographum symplocacearum* HINO et KATUMOTO, see page 2.
15. *Botryosphaeria dothidea* (MOUG. ex FR.) CES. et deNOT., see page 3.
16. *B. melanops* (TUL.) WINTER, see page 3.
17. *Cercospora abelmoschi* ELL. et EV. (=*C. hibisci* TRACY et EARLE), (34) (59), on *Hibiscus syriacus* (Mukuge)
18. *C. araliae* HENN., (33) (34), on *Aralia elata* (Taranoki)
19. *C. buddlejae* YAMAMOTO, (31) (34), on *Beddleja venenifera* (Urajiro-fuji-utsgi)
20. *C. chionea* ELL. et EV., (33) (34) (58), on *Cercis chinensis* (Hanazuô)
21. *C. clerodendri* MIYAKE, (33) (34), on *Clerodendron trichotomum* (Kusagi)
22. *C. cocculi* SYD., (33), on *Cocculus trilobus* (Ao-tsuzura-fuji)
23. *C. cryptomeriae* SHIRAI, see page .
24. *C. hederae* TOGASHI et KATSUKI, (33), on *Hedera rhombea* (Kizuta)
25. *C. hydrangeae* ELL. et EV., (34), on *Hydrangea macrophylla* (Ajisai)
26. *C. kadsurae* TOGASHI et KATSUKI, (31) (33) (34) (58), on *Kadsura japonica* (Sane-kazura)
27. *C. kaki* ELL. et EV., (33) (34), on *Diospyros kaki* (Kaki)
28. *C. kurimaensis* FUKUI (=*C. nerii-indici* YAMAMOTO), (34), on *Nerium indicum* (Kyôchikutô)
29. *C. kusanoi* SAWADA (=*C. flexuosa* TANAKA), (34), on *Morus bombycis* (Yama-guwa)
30. *C. litseae-glutinosae* H. et P. SYD., (31) (33) (34) (59), on *Litsea japonica* (Hama-biwa)

*) Figure in parentheses indicates the literature number. Literatures, in which the fungus was recorded from Yaku Island, were presented in this list.

31. *C. lonicericola* Yamamoto, (33) (34), on *Lonicera japonica* (Suikazura)
32. *C. latens* Ell. et Ev. (=*C. lespedezae* Ell. et Ev.), (33) (34), on *Lespedeza homoloba* (Tsukushi-hagi), *L. cyrtobotrya* (Maruba-hagi)
33. *C. malayensis* Stev. et Solh., (33) (34) (58), on *Hibiscus tiliaceus* (Yama-asa)
34. *C. malloti* Ell. et Ev., (33) (34), on *Mallotus japonicus* (Akame-gashiwa)
35. *C. obtegens* P. et H. Syd., (33), on *Hydrangea macrophylla* (Ajisai)
36. *C. pittospori* Plakidas, (33) (34) (59), on *Pittosporum tobira* (Tobera)
37. *C. premnae* Castellani, (31) (33) (34), on *Premna japonica* (Hama-kusagi)
38. *C. prunicola* Ell. et Ev., (33) (34), on *Prunus yedoensis* (Somei-yoshino)
39. *C. rhoina* Cke. et Ell., (33) (34), on *Rhus javanica* (Nurude)
40. *C. riachueli* Speg. (=*C. horiana* Togashi et Katsuki), (33) (34), on *Parthenocissus tricuspidata* (Tsuta)
41. *C. rubi* Sacc., (33) (34), on *Rubus sieboldii* (Hôroku-ichigo), *R. grayanus* (Ryûkyû-ichigo), *R. parvifolius* (Nawashiro-ichigo), *R. yakumontanus* (Yakushima-ichigo)
42. *C. subsessilis* H. et P. Syd., (33) (34) (58), on *Melia azedarach* (Sendan)
43. *C. taihokuensis* Sawada, (31) (33) (34), on *Glochidion hongkongense* (Kakiba-kankonoki)
44. *C. trilobi* Chupp, (34), on *Cocculus trilobus* (Ao-tsuzura-fuji)
45. *C. violamaculans* Fukui, (33) (34), on *Rhaphiolepis umbellata* (Sharinbai), *R. umbellata* var. *integerrima* (Maruba-sharinbai)
46. *C. yakushimensis* Togashi et Katsuki, (31) (33) (34) (58), on *Hydrangea kawagoeana* (Tokara-ajisai)
47. *Clasterosporium degenerans* Syd., (33), on *Prunus mume* (Ume)
48. *Coleopucciniella idei* Hiratsuka, (25) (26) (28) (33), on *Rhaphiolepis umbellata* (Sharinbai)
49. *Coleosporium clematidis* Barcl., (28), on *Clematis terniflora* (Senninso)
50. *C. clematidis-apiifoliae* Diet., (28) (33), on *Clematis apiifolia* (Botan-zuru), *C. pierotii* (Kobano-botan-zuru)
51. *C. clerodendri* Diet., (26) (28) (32) (45), on *Clerodendron trichotomum* (Kusagi)
52. *C. evodiae* Diet. ex Hiratsuka, (26) (28) (32), on *Evodia glauca* (Hama-sendan)
53. *C. zanthoxyli* Diet. et Syd., (26) (28) (32) (45), on *Fagara ailanthoides* (Karasu-zanshô), *F. shinifolia* (Inu-zanshô)
54. *Colletotrichum gloeosporioides* Penz., see page 5.
55. *C. morifolium* Hara, (33), on *Morus bombycis* (Yama-guwa)
56. *Crossopsora malloti* (Racib.) Cumm., (31) (32), on *Mallotus japonicus* (Akame-gashiwa)
57. *Cystotheca lanestris* (Harkn.) Miyabe apud Ideta, see page 6.
58. *Diplodina pseudosasae* Hino et Katumoto, (22) (23), on *Pseudosasa owatarii* (Yakushima-yadake)
59. *Discosia atrocreas* (Tode) Fries, see page 8.
60. *D. deflectens* Sacc., see page 7.
61. *Echidnodella rapanaeae* Hino et Katumoto, (21) (39), on *Myrsine seguinii* (Taimin-tachibana)
62. *Elsinoe fawcetti* Bitanc. et Jenk., (32), on *Citrus aurantium* var. *ponki* (Ponkan), *C. grandis* (Buntan), *Poncirus trifoliata* (Karatachi)
63. *E. veneta* (Burk.) Jenk., (31) (32), on *Rubus grayanus* (Ryûkyû-ichigo), *R. sieboldii* (Hôroku-ichigo)
64. *Endophyllum machili* (Henn.) Stev., see page 8.

65. *Endothia macrospora* Kobayashi et Ito, see page 8.
66. *E. nitschkei* Otth, see page 8.
67. *Exobasidium hemisphaericum* Shirai, (21), on *Rhododendron metternichii* var. *yakusimanum* (Yakushima-shakunage)
68. *Ganoderma fornicatum* (Fr.) Pat., (35), on *Machilus japonica* (Hosobatabu)
69. *Gerwasia rubi* Racib., (28) (32) (45), on *Rubus buergeri* (Fuyu-ichigo)
70. *Hamaspora rubi-sieboldii* (Kawagoe) Diet., (26) (28) (32) (45), on *Rubus sieboldii* (Hôroku-ichigo)
71. *Helminthosporium desmodii* Togashi et Katsuki, (33), on *Desmodium heterocarpon* (Shiba-hagi)
72. *Hemileia gardeniae-floridae* Sawada, (26) (28) (32), on *Gardenia jasminoides* f. *grandiflora* (Kuchinashi)
73. *Hendersonula yakushimensis* Kobayashi, conidial state of *Trematosphaeria yakushimensis*, see page 13.
74. *Hypoderma insularis* Kobayashi, see page 8.
75. *Hypoxylon nummularium* var. *australe* (Cke.) Miller, see page 8.
76. *Irene buxi* Hino et Katumoto, (20), on *Buxus microphylla* var. *japonica* (Tsuge)
77. *Irenina manca* (Ell. et Mart.) Stev., (31) (32), on *Myrica rubra* (Yama-momo)
78. *I. viburni* (Syd.) Stev., (31) (32), on *Viburnum awabuki* (Sango-jyu)
79. *Kmetia ampelopsidis* Sawada, (31) (33), on *Ampelopsis brevipedunculata* (No-budô)
80. *Kuhneola callicarpae* Syd., (26) (28) (32), on *Callicarpa japonica* (Murasaki-shikibu), *C. mollis* (Yabu-murasaki), *C. japonica* var. *luxurians* (Ô-murasaki-shikibu)
81. *K. japonica* (Diet.) Diet., (28) (32), on *Rosa wichuraiana* (Teriha-noibara)
82. *Lembocina nipponica* Katumoto, (39), on *Quercus phillyraeoides* (Ubame-gashi)
83. *Leptosphaeria buddlejae* Hino et Katumoto, (21), on *Buddleja venenifera* (Urajiro-fuji-utsugi)
84. *Leptothyrium yoshinagai* Henn., (36) (39), on *Daphniphyllum teijismanni* (Hime-yuzuriha)
85. *Lophodermium pinastri* (Schrad.) Chev., (32), on *Pinus thunbergii* (Kuro-matsu)
86. *Macrophoma musae* (Cke.) Berl. et Vogl., (31), on *Musa paradisiaca* var. *sepientum* (Banana)
87. *Melampsora idesiae* Miyabe et Hiratsuka, (28), on *Idesia polycarpa* (Iigiri)
88. *M. yoshinagai* Henn., (28) (32), on *Wikstroemia ganpi* (Ko-ganpi), *W. yakusimensis* (Shima-sakura-ganpi)
89. *Meliola australis* Hino et Katumoto, (21), on *Myrsine seguinii* (Taimin-tachibana)
90. *M. formosensis* Yamamoto, (31) (32) (38), on *Rubus sieboldii* (Hôroku-ichigo), *R. yaku-montanus* (Yakushima-kiichigo), *R. palmatus* var. *coptophyllus* (Momiji-ichigo)
91. *M. hederae* Yamamoto, (32), on *Hedera rhombea* (Kizuta)
92. *M. tanakaeana* Hino et Katumoto, (21), on *Symplocos tanakae* (Hirohano-mimizubai)
93. *Micropeltis fumosa* Hino et Katumoto, (21) (39), on *Neolitsea aciculata* (Inu-gashi)
94. *M. yakusimensis* Hino et Katumoto, (21) (39), on *Myrsine seguinii* (Taimin-tachibana)
95. *Mycosphaerella aleuritidis* (Miyake) Ou (=*C. aleuritidis* Miyake), (33) (34), on *Aleurites cordata* (Abura-giri)
96. *M. cleyerae* Kobayashi, see page 9.
97. *M. cryptomeriae* Shirai et Hara, see page 9.
98. *M. dephniphylli* Syd. et Hara, (32), on *Daphniphyllum teijsmanni* (Hime-yuzuriha)
99. *M. persica* (Sacc.) Higgins, (32), on *Prunus persica* (Momo)
100. *M. yaku-insularis* Kobayashi, see page 9.

101. *Ochropsora nambuana* (Henn.) Diet., (26) (28) (32), on *Elaeagnus umbellata* (Aki-gumi), *E. umbellata* var. *rotundifolia* (Maruba-aki-gumi)
102. *Oidium euonymi-japonicae* (Arc.) Sacc., (32), on *Euonymus japonicus* (Masaki)
103. *Pestalotia guepini* Desm., (33), on *Camellia japonica* (Yabu-tsubaki)
104. *P. longi-aristata* Maubl., (33), on *Podocarpus macrophyllus* (Inu-maki)
105. *Pestalotiopsis adusta* (Ell. et Ev.) Stey., see page 10.
106. *Phakopsora ampelopsidis* Diet. et Syd. (26) (28) (32), on *Ampelopsis brevipedunculata* (Nobudô)
107. *P. ehretiae* Hiratsuka, (28), on *Ehretia ovalifolia* (Chishanoki)
108. *P. fici-erectae* Ito et Otani, (25) (26) (32), on *Ficus erecta* (Inu-biwa), *F. erecta* var. *sieboldii* (Hosoba-inubiwa), *F. miyagii* (Akame-inubiwa), *Morus bombycis* (Yama-guwa), *M. australis* (Shima-guwa)
109. *P. malloti* (Racib.) Cumm., (28), on *Mallotus japonicus* (Akame-gashiwa)
110. *P. pachyrhizi* Syd., (32), on *Pueraria lobata* (Kuzu)
111. *Phragmidium griseum* Diet., (28) (32), on *Rubus rosaefolius* subsp. *maximowiczii* (Ryûkyû-bara-ichigo), *R. minusculus* (Hime-bara-ichigo)
112. *P. pauciloculare* (Diet.) Syd., (28), on *Rubus parvifolius* (Nawashiro-ichigo)
113. *Phyllachora fici-wightianae* Sawada, (31) (32), on *Ficus wightiana* (Akô)
114. *P. phyllostachydis* Hara, (32), on *Phyllostachys nigra* var. *henonis* (Hachiku)
115. *P. shiraiana* Syd., (23), on *Sasa owatarii* (Yakushima-dake)
116. *Phyllactinia moricola* (Henn.) Homma, (32), on *Morus bombycis* (Yamaguwa)
117. *Phyllosticta ardisiae* Trinchieri, (31) (32), on *Ardisia sieboldii* (Moku-tachibana)
118. *P. cocculi* Speg., (31), on *Cocculus laurifolius* (Kôshu-uyaku)
119. *P. cruenta* Kichx, (33), on *Smilax china* (Sarutori-ibara)
120. *P. cryptomeriae* Kawamura, see page 12.
121. *P. eriobotryae* Thuem., (33), on *Eriobotrya japonica* (Biwa)
122. *P. glochidionia* Sawada, (31) (33), on *Glochidion obovatum* (Kankonoki)
123. *P. multimaculans* Kobayashi, see page 12.
124. *P. pittospori* Brun., (31) (33), on *Pittosporum tobira* (Tobera)
125. *P. tremae* Katsuki, (30) (31) (33), on *Trema orientalis* (Urajiro-enoki)
126. *Physalospora erycibes* Sawada, (21), on *Erycibe henryi* (Horuto-kazura)
127. *P. japonica* Togashi, (32), on *Camellia japonica* (Yabu-tsubaki)
128. *P. morindae* Koord., (31) (32), on *Morinda umbellata* (Hanagasanoki)
129. *Pileolaria pistaciae* Tai et Wei, (26) (28) (31) (32), on *Pistacia chinensis* (Ranshinboku)
130. *P. shiraiana* (Diet. et Syd.) Ito, (28), on *Rhus succedea* (Hazenoki)
131. *Plagiosphaera quercicola* Kobayashi, see page 12.
132. *Plagiostigme neolitseae* Kobayashi, see page 12.
133. *Plasmopara viticola* (Berk. et Curt.) Berl. et de Toni, (32), on *Vitis ficifolia* var. *lobata* (Ebizuru)
134. *Plectosphaera actinodaphneae* Kobayashi, see page 12.
135. *P. yakusimensis* Hino et Katumoto, (37), on *Rhododendron metternichii* var. *yakusimanus* (Yakushima-shakunage)
136. *Pseudocercospora vitis* (Lév.) Speg. (=*Phaeoisariopsis vitis* (Lév.) Sawada), (33), on *Vitis vinifera* (Budô)
137. *Puccinia buxi* DC., (26) (28) (32) (45), on *Buxus microphylla* var. *japonica* (Tsuge), *B.*

japonicus var. *rotundifolia* (Maruba-tsuge)

138. *P. ferruginea* Lév., apud Vail., (28) (32) (35) (45), on *Smilax china* (Sarutori-ibara), *S. bracteata* (Satsuma-sankirai), *S. china* var. *yakusimensis* (Yakushima-kakara)
139. *P. smilacis-sieboldii* Hiratsuka, (26) (28), on *Smilax china* (Sarutori-ibara)
140. *Pucciniastrum actinidiae* Hiratsuka, (28) (32), on *Actinidia rufa* (Shima-sarunachi)
141. *P. corni* Diet., (26) (28) (32), on *Cornus kousa* (Yamaboushi)
142. *P. hydrangeae-petiolaridis* Hiratsuka, (26) (28) (32), on *Hydrangea petiolaris* (Gotô-zuru)
143. *P. kusanoi* Diet., (26) (32), on *Clethra barbinervis* (Ryôbu)
144. *P. stachyuri* Hiratsuka et Yoshinaga, (28), on *Stachyurus matsuzakii* (Nanban-kibushi)
145. *P. styracinum* Hiratsuka, (26) (28) (32), on *Styrax japonicum* (Egonoki)
146. *Rhinotrichum griseum* Sacc., (33), on *Rubus parvifolius* (Nawashiro-ichigo)
147. *Rhytisma ilicis-latifoliae* Henn., see page 12.
148. *R. punctata* (Pers.) Fr., (32), on *Acer insulare* (Shima-uri-kaede)
149. *R. shiraiana* Hemmi et Kurata, (32), on *Rhododendron tashiroi* (Sakura-tsutsuji)
150. *Septobasidium bogoriense* Pat. (=*S. pedicellatum* (Schw.) Pat.), on *Prunus mume* (Ume)
151. *Septoria corni-controversae* Sawada, see page 12.
152. *S. rubi* West., see page 12.
153. *S. sambucina* Peck, (31) (33), on *Sambucus chinensis* (Sokuzu)
154. *Sphaceloma araliae* Jenk., (33), on *Schefflera octophylla* (Fukanoki)
155. *S. rhois* Bitanc. et Jenk., see page 13.
156. *Sphaerognomonia haraeana* Kobayashi, see page 13.
157. *Sphaerotheca humuli* (DC.) Bull., (32), on *Clerodendron trichotomum* (Kusagi), *Spiraea cantonensis* (Kodemari)
158. *Synchytrium minutum* (Pat.) Gaeum., (32), on *Pueraria lobata* (Kuzu)
159. *Trematosphaeria yakushimensis* Kobayashi, see page 13.
160. *Trochophora simplex* (Petch) Moore (=*Helicostilbe simplex* Petch), (33), on *Daphniphyllum teijismanni* (Hime-yuzuriha)
161. *Uredo horikawai* Morimoto, (28) (33) (45), on *Diospyros morrisiana* (Tokiwa-gaki)
162. *U. yakushimensis* Morimoto, (28) (45), on *Psychotoria serpens* (Shiratama-kazura)
163. *Uromyces amurensis* Komar., (32), on *Maackia tashiroi* (Shima-enjyu)
164. *U. lespedezae-procumbentis* (Schw.) Curt., (28) (32), on *Lespedeza cuneata* (Medo-hagi), *L. cyrtobotrya* (Maruba-hagi)
165. *Ustilago shiraiana* Henn., (32), on *Phyllostachys aurea* (Kuretaki)
166. *Vestergrenia daphniphylli* Kobayashi, see page 13.
167. *Xenostele sakamotoi* (Hiratsuka et Yoshinaga) Ito et Murayama, (26) (28) (32) (45), on *Distylium racemosum* (Isunoki)

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Explanation of plates

Aulographum symplocacearum Hino et Katumoto

Plate 1, A : Diseased leaves of *Symplocos myrtacea*
B : Perithecium
C : Asci showing thick membrane at their tip (by phase contrast)
D : Ascospores having vacuoles (by phase contrast)

Botryosphaeria dothidea (Moug. ex Fries) Ces. et de Not.

Plate 1, E : Dead bark of *Quercus salicina* showing black stromata
F : Stroma having perithecia in its peripheral part
Plate 2, A : Asci having thick membrane at their tip (by phase contrast)
B : Ascospores (by phase contrast)
C : Pycnidia produced on PDA, showing white conidial masses at their tip; an ascospore isolate
D : Conidia produced on PDA

Botryosphaeria melanops (Tulasne) Winter

Plate 2, E : Dead bark of *Quercus myrsinaefolia* showing black stromata
F : Ascospores

Colletotrichum gloeosporioides Penzig

Plate 3, A : Diseased leaf of *Rhododendron metternichii* var. *yakushimanus*

B : Acervulus

Cystotheca lanestris (Harkness) Miyabe apud Ideta

Plate 3, C : Diseased leaf of *Quercus salicina*; lower leaf surface

Discosia deflectens Saccardo

Plate 3, D : Diseased leaves of *Ilex buergeri*; right—upper leaf surface, left—lower leaf surface

E : Conidial layer (pycnidium)

F : Conidia showing septa and cilia (by phase contrast)

Discosia artocreas (Tode) Fries

Plate 4, A : Conidial layer (pycnidium) produced on dead leaf of *Quercus salicina*

B : Conidia having cilia (by phase contrast)

Endothia macrospora Kobayashi et Ito

Plate 4, C : Perithecial stroma produced on bark of *Quercus salicina*

D : Ascus containing 8 ascospores irregularly in biseriate and showing apical ring at its tip (by phase contrast)

Hypoxylon nummularium var. *australe* (Cooke) Miller

Plate 4, E : Stroma formed on dead bark of unknown host

Plate 5, A : Section of stroma having perithecia in its peripheral part

B : Mass of asci

C : Two asci having 8 ascospores in a row and showing apical apparatus blued with iodine (by phase contrast)

Mycosphaerella yaku-insularis Kobayashi

Plate 5, D : Diseased leaf of *Ilex buergeri*

E : Perithecium

Pestalotiopsis adusta (Ellis et Everhart) Steyaert

Plate 6, A : Diseased leaves of *Hydrangea luteo-venosa*

B : Acervulus (pseudopycnidium)

Phyllosticta multimaculans Kobayashi

Plate 6, C : Diseased leaf of *Lindera citriodora*

Septoria rubi Westendorp

Plate 6, D : Diseased leaf of *Rubus crataegifolius*

E : Pycnidium

屋久島産樹木類寄生菌*)

小　林　享　夫(1)

摘　　要

屋久島は九州南方約 60 km の海上に浮かぶ面積約 500 km² の島である。年間降雨量が 5,000～8,000 mm という多雨の気象的特徴と，海岸から九州の最高峰約 1,900 m の山頂まで著しい標高差を有する地理的特徴によって，その植物相はきわめて変化にとんでいる。そして植物相の変化と相まって，それらに寄生する植物寄生菌類相もまた北方系，南方系の要素が混在し，地理誌的に興味深いものがある。

屋久島からは，今までに香月（1950, 1953, 1955a, 1955b），森本（1953），平塚ら（1955），日野・勝本（1958, 1962 等）などの植物病理学および菌学の研究者により 64 属 140 種の樹木類および蔓性植物の寄生菌類が報告されている。筆者は 1975 年 6 月 29 日より 7 月 9 日にいたる約 10 日間の調査により，新たに 20 属に属する 25 種の樹木類寄生菌類（新たに加えた属は 11 属）を屋久島産の植物寄生菌類フロラに加えることができた。このうち 10 種は新種として記載し，2 種はわが国での最初の記録である。また 7 種の新しい寄主植物が追加された。

これらを含めた屋久島産の樹木類および蔓性植物の寄生菌類は，藻菌類 2 属 2 種，子のう菌類 31 属 56 種，担子菌類 22 属 46 種，不完全菌類 20 属 61 種，合計して 75 属 165 種となる。

これらのうち，まだ屋久島からしか知られていない菌類は 19 属 25 種で，全体の約 15% である。屋久島をもって南限とする種類は 15 属 19 種，北限とする種類が 14 属 20 種で，いずれも全体の約 12% を占める。すなわち，この数字からみる限り，屋久島で交さくする南方系，北方系の要素はほぼ同数であるといってよかろう。

なおここに報告した寄生菌類のうち，以下のものについては，新たに病名を与えることとする。

Aulographum symplocacearum Hino et Katumoto：ハイノキのこまるほし小円星病菌

Botryosphaeria dothidea (Moug. ex Fr.) Ces. et de Not. および *B. melanops* (Tul.) Winter：カシ類のさめはだ（鮫肌）胴枯病菌

Discosia deflectens Sacc.：シイモチの黒やに（脂）斑点病

Mycosphaerella yaku-insularis Kobayashi：シイモチの葉枯病菌

Pestalotiopsis adusta (Ell. et Ev.) Steyaert：コガクウツギ（アジサイ類）のペスタロチア病菌

Phyllosticta multimaculans Kobayashi：アオモジの小黒斑病

Septoria rubi West.：クマイチゴ（キイチゴ類）の褐斑病菌

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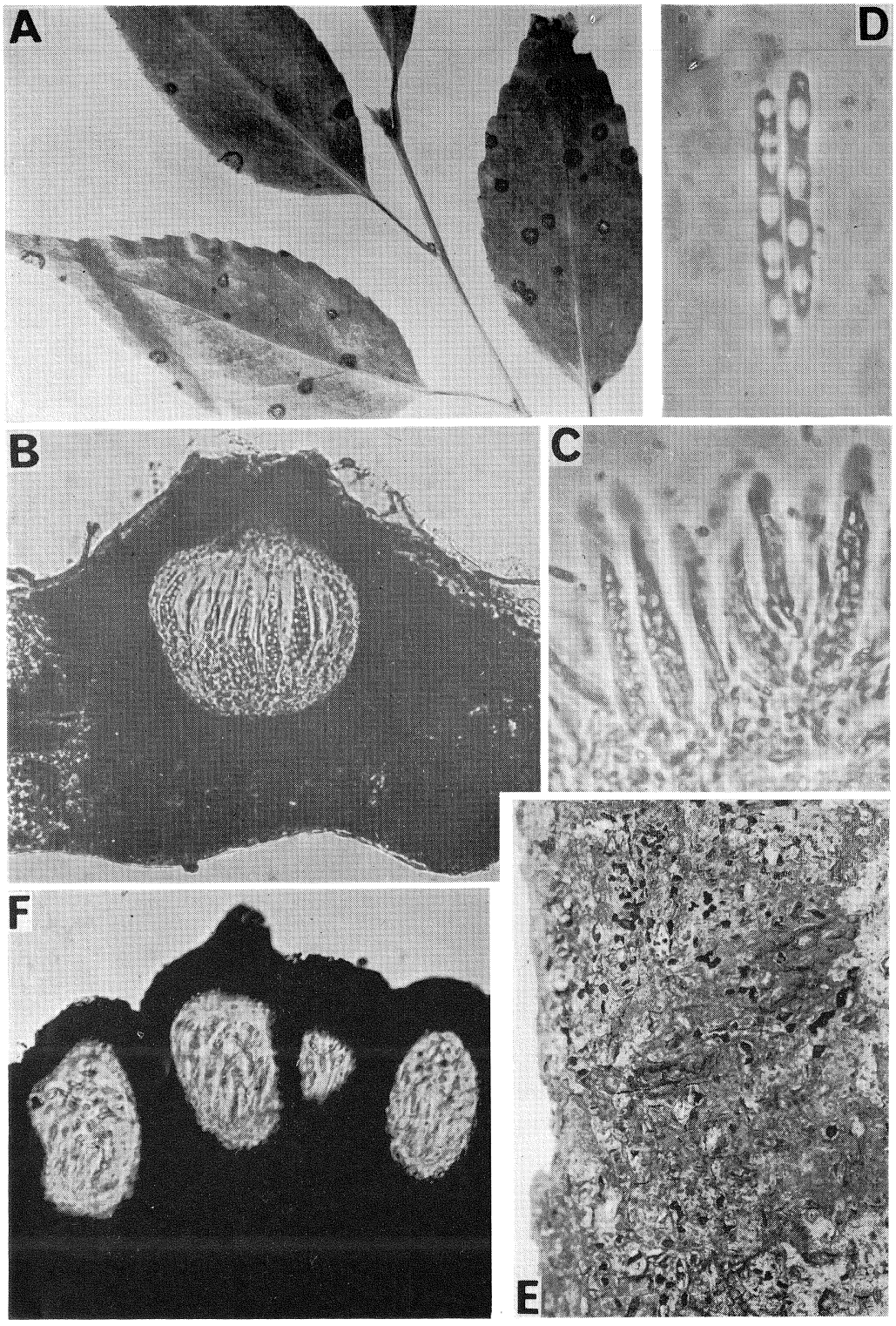
*) 本報告は文部省国立科学博物館による「日本列島の自然史科学的総合研究」の第 2 期「西南日本外帯の自然史科学的総合研究」の一環として行われた屋久島における菌類相調査の一部である。本調査による成果の一部は「屋久島産の新しい樹木類寄生菌」として科学博物館専報第 9 号に印刷されたが，本報告には重複をさけ全体的なとりまとめを行った。

1976年 8 月30日受理

(1) 保　護　部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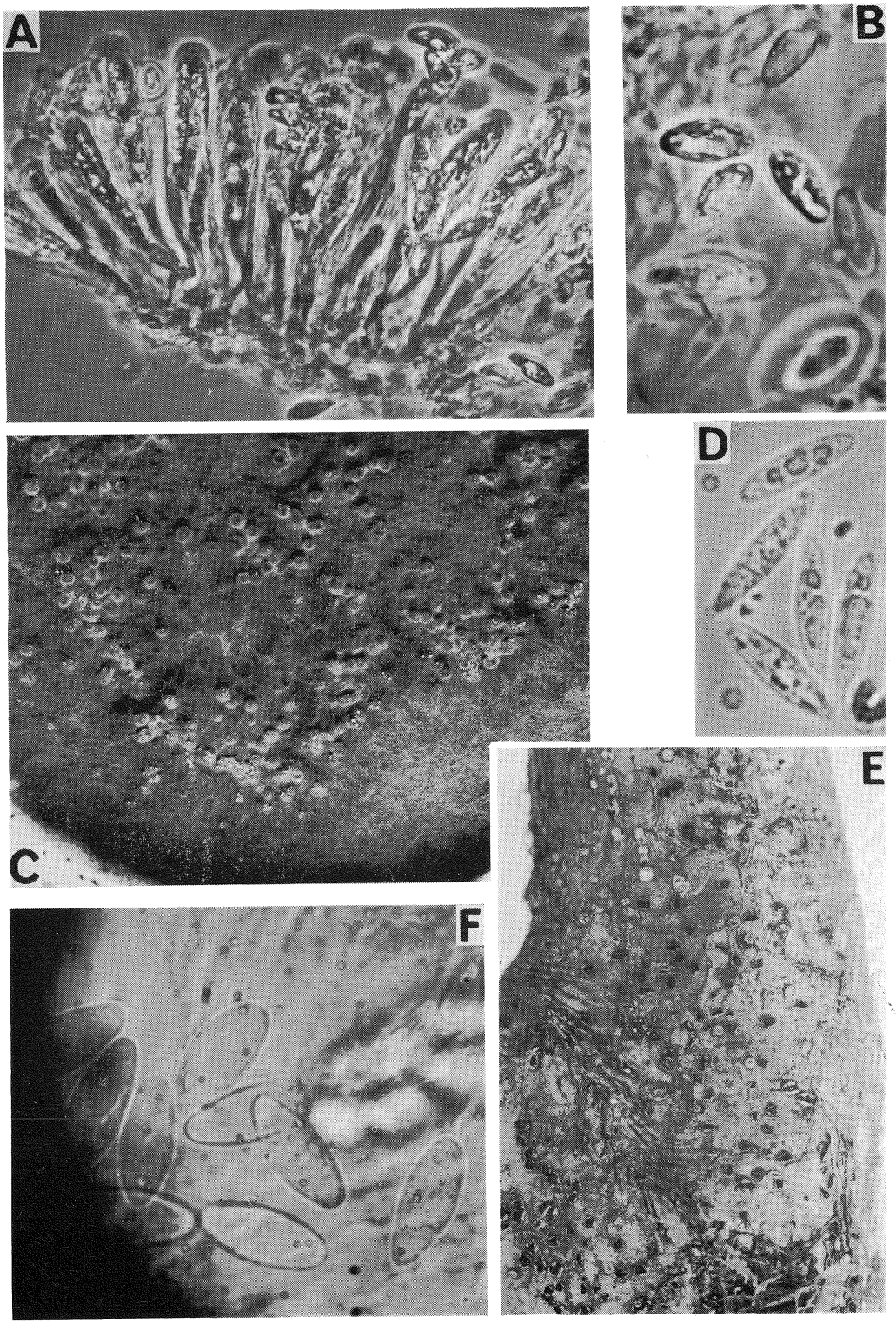
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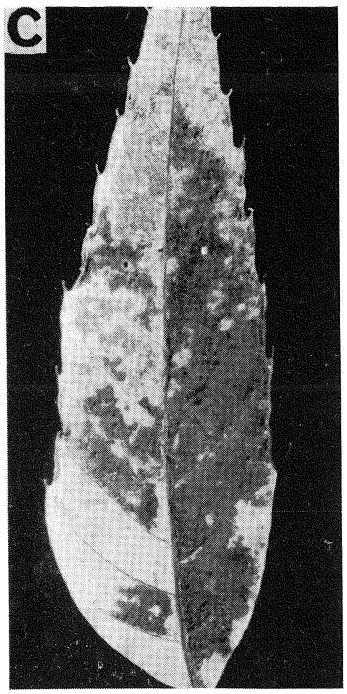
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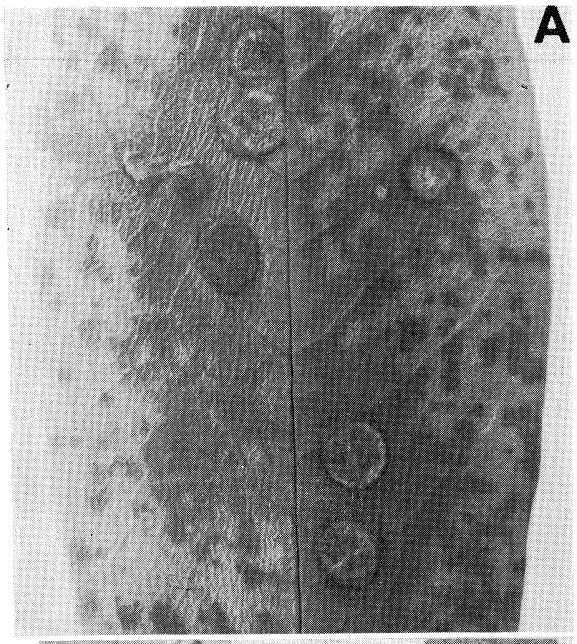
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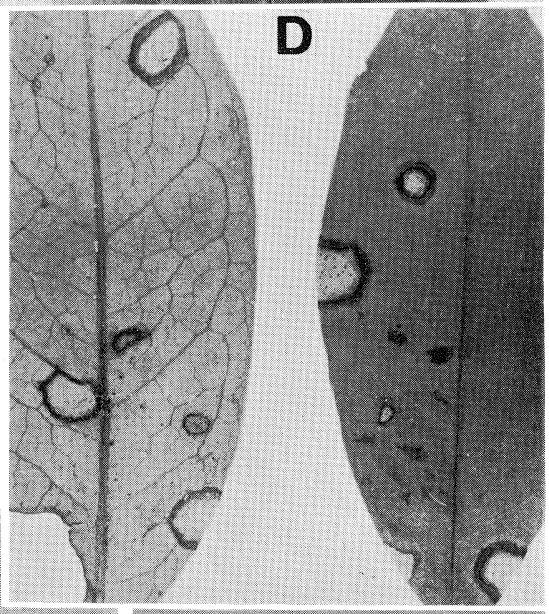
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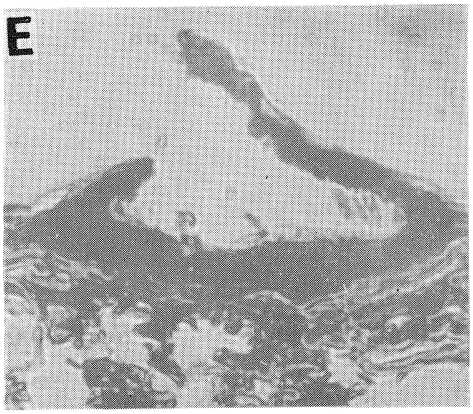
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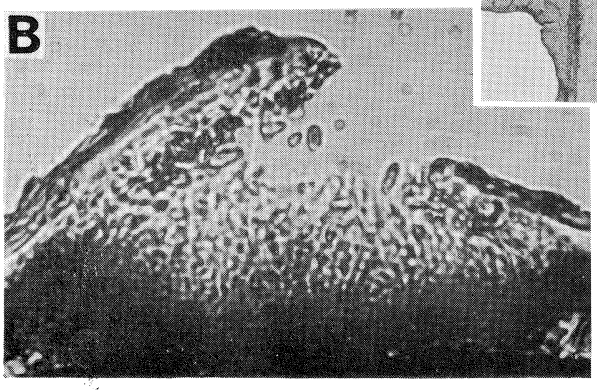
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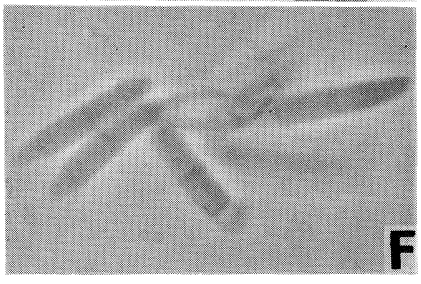
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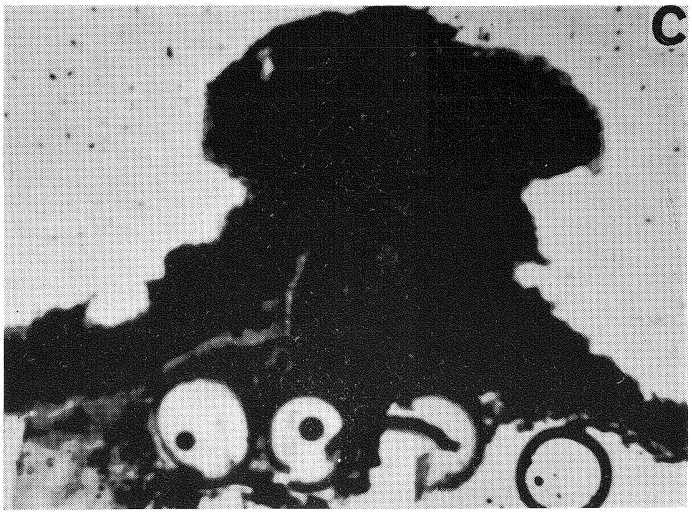
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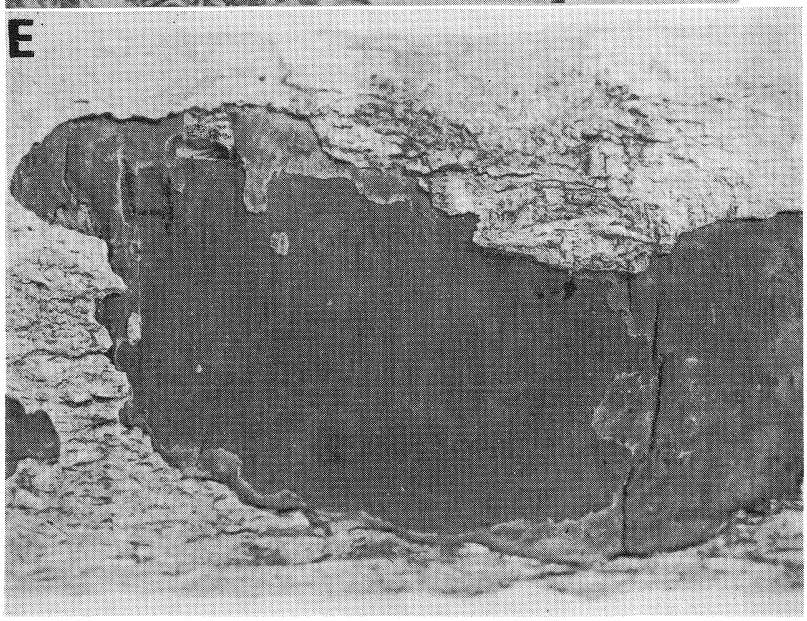
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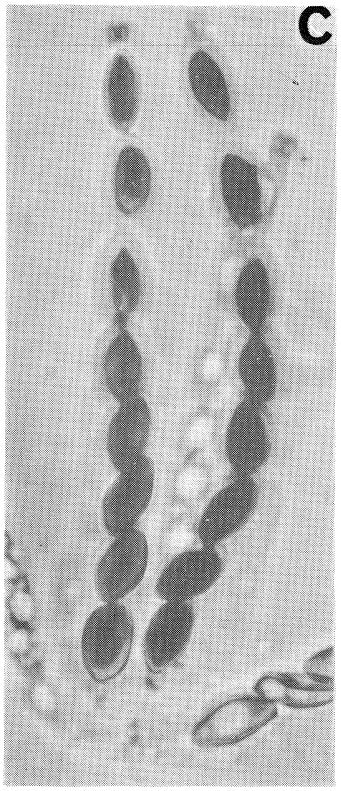
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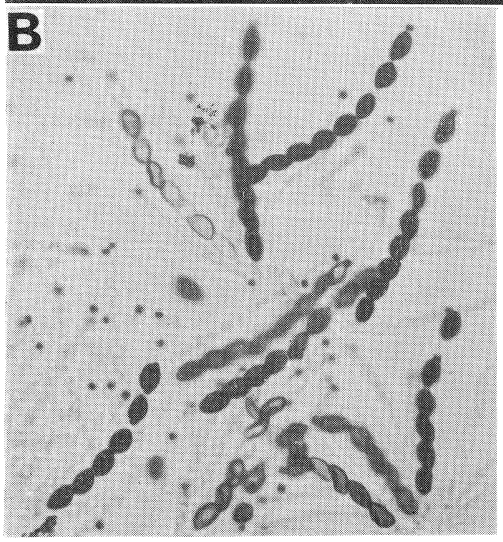
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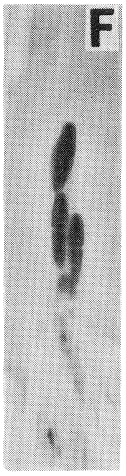
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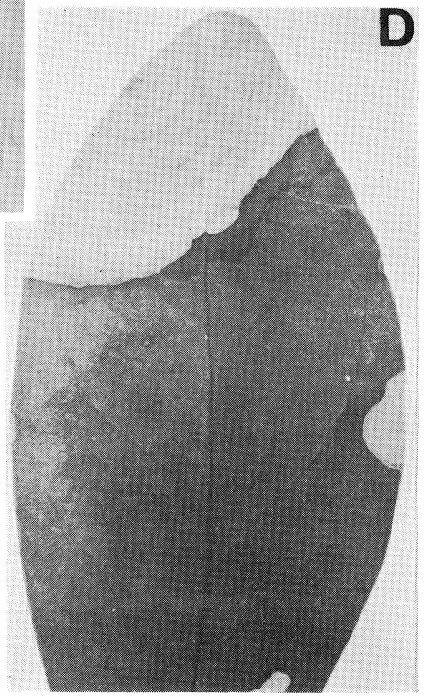
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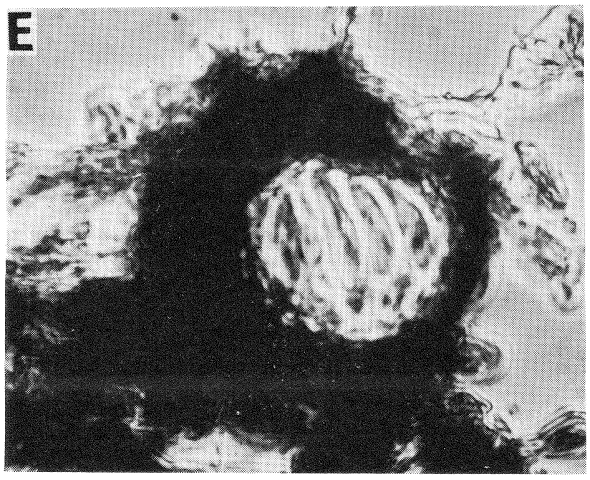
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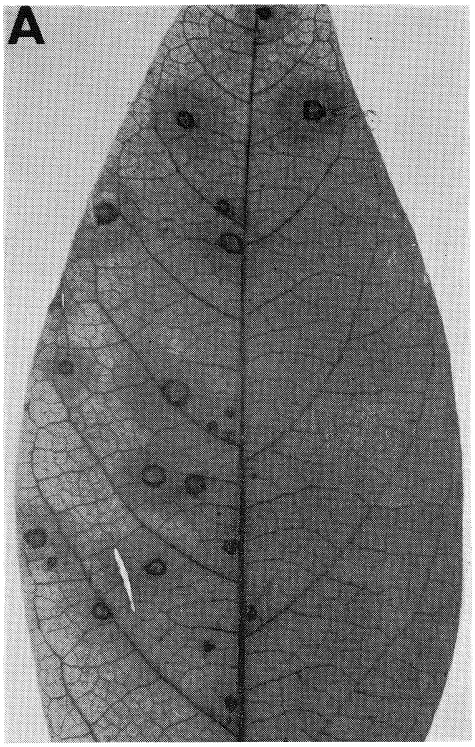
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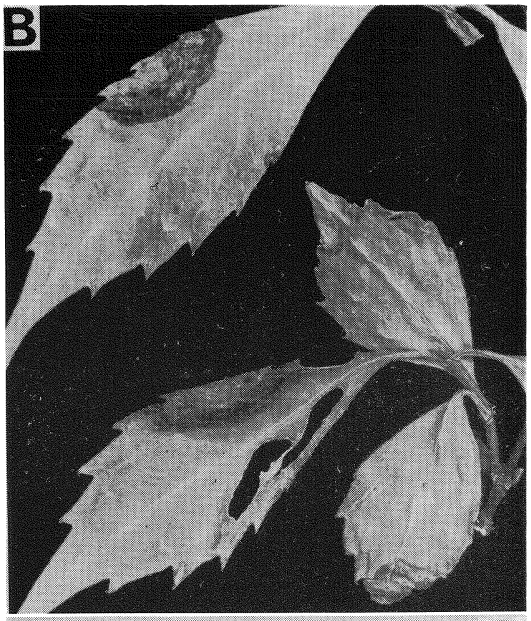
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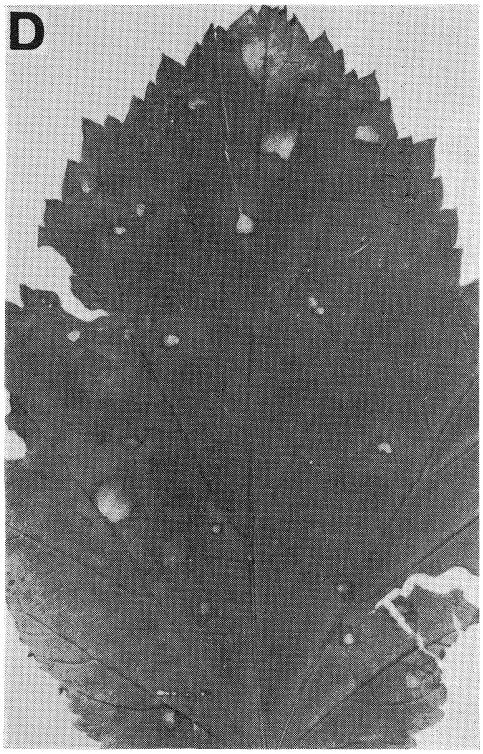
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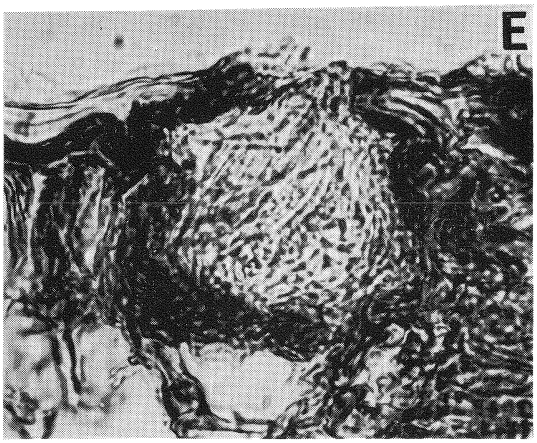
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